

# Exhibit 2

## Redacted Version

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**UNITED STATES DISTRICT COURT  
NORTHERN DISTRICT OF CALIFORNIA  
SAN JOSE DIVISION**

CISCO SYSTEMS, INC.,

Plaintiff,

v.

ARISTA NETWORKS, INC.,

Defendant.

Case No. 5:14-cv-05344-BLF (PSG)

**REBUTTAL EXPERT REPORT OF KEVIN ALMEROTH**

**SUBMITTED ON BEHALF OF CISCO SYSTEMS, INC.**

**CONTAINS HIGHLY CONFIDENTIAL – ATTORNEYS’ EYES ONLY INFORMATION**

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Copying – A	Almeroth CV
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<b>Exhibit</b>	<b>Description</b>
Copying – 1-8	See opening report

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**I. INTRODUCTION**

1. I have been retained by counsel for Cisco Systems, Inc. (“Cisco”) as an expert in this litigation to provide opinions regarding Cisco’s copyrighted works and the infringement of certain Cisco copyrights by Arista Networks, Inc. (“Arista”).

2. I have also been asked to analyze and respond to the following expert reports submitted on June 3, 2016 on behalf of Arista:

- Expert Report of John R. Black Jr. (“Black”)
- Expert Report and Disclosure of Cate M. Elsten (“Elsten”)
- Opening Expert Report of Williams M. Seifert (“Seifert”)

3. My analysis, opinions, and reasoning are detailed below and in my opening report as well as the exhibits that accompanied my opening report, which provide additional analysis, opinion, reasoning, and evidence, and which are incorporated here by reference.

4. I am paid my customary rate of \$600 an hour for time spent on research, report preparation, deposition and/or trial. I am reimbursed for incurred expenses. I have not received, and do not expect to receive, any additional compensation for my work on this action, and payment of my fees is in no way contingent upon the outcome of this case, the outcome of my investigation, or the opinions that I provide.

5. In this report I have provided the following main opinions/rebuttals:

a. None of Arista’s experts have shown that Cisco’s copyrighted works or its IOS CLI is an industry standard and, in fact, the data provided by Dr. Black confirms my opinions.

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b. I disagree with Arista’s experts’ opinions regarding the originality and creativity of Cisco’s copyrighted works, and none of their opinions show that any of the copyrighted works are unoriginal or not creative.

c. Arista’s experts’ opinions regarding the doctrines of *scenes a faire*, merger, and short phrases are inapplicable to the copyrighted works at issue in this case, and I therefore disagree that they have any impact on the copyrightability or originality of the copyrighted works.

d. None of Arista’s experts have come forward with evidence or opinion that would tend to show that any of the fair use factors—which I understand Arista bears the burden on—favor Arista.

e. I disagree with Arista’s experts’ discussion and analysis of certain ancillary products not at issue in this case (e.g., network orchestration products and ConfD), and it is my opinion that those products have no bearing on whether Arista copied Cisco’s copyrighted works in this case.

## **II. BACKGROUND & QUALIFICATIONS**

### **A. Qualifications**

6. In forming my opinions, I am relying on my education and experience as described below.

7. I summarize in this section my educational background, career history, publications, and other relevant qualifications.

8. I am currently a Professor in the Department of Computer Science at the University of California, Santa Barbara (UCSB). I also hold an appointment and am a founding member of the Computer Engineering (CE) Program. I am a founding member of the Media

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Arts and Technology (MAT) Program, and the Technology Management Program (TMP). I also served as the Associate Director of the Center for Information Technology and Society (CITS) from 1999 to 2012. I have been a faculty member at UCSB since July 1997.

9. I hold three degrees from the Georgia Institute of Technology: (1) a Bachelor of Science degree in Information and Computer Science (with minors in Economics, Technical Communication, and American Literature) earned in June 1992; (2) a Master of Science degree in Computer Science (with specialization in Networking and Systems) earned in June 1994; and (3) a Doctor of Philosophy (Ph.D.) degree in Computer Science (Dissertation Title: Networking and System Support for the Efficient, Scalable Delivery of Services in Interactive Multimedia Systems, with a minor in Telecommunications Public Policy) earned in June 1997.

10. One of the major themes of my research has been the delivery of multimedia content and data between computing devices and users. In my research, I have looked at large-scale content delivery systems and the use of servers located in a variety of geographic locations to provide scalable delivery to hundreds, even thousands, of users simultaneously. I have also looked at smaller-scale content delivery systems in which content, including interactive communication like voice and video data, is exchanged between computers and portable computing devices. As a broad theme, my work has examined how to exchange content more efficiently across computer networks, including the devices that switch and route data traffic. More specific topics include the scalable delivery of content to many users, mobile computing, satellite networking, delivering content to mobile devices, and network support for data delivery in wireless network.

11. Beginning in 1992, when I started graduate school, the first focus of my research was on the provision of interactive functions (VCR-style functions like pause, rewind, and fast-

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forward) for near video-on-demand systems in cable systems. In particular, my work explored how to aggregate requests for movies at a cable head-end, and then how to satisfy a multitude of requests using one audio/video stream broadcast to multiple receivers simultaneously.

Continued evolution of this research has resulted in the development of new techniques to scalably deliver on-demand content including audio, video, web documents, and other types of data, through the Internet and over other types of networks, including cable systems, broadband telephone lines, and satellite links.

12. An important component of my research from the very beginning has been investigating the challenges of communicating multimedia content between computers and across networks. Although the early Internet was designed mostly for text-based non-real time applications, the interest in sharing multimedia content quickly developed. Multimedia-based applications range from downloading content to a device to streaming multimedia content to be instantly used. One of the challenges is that multimedia content is typically larger than text-only content, but there are also opportunities to use different delivery techniques since multimedia content is more resilient to errors. I have worked on a variety of research problems and used a number of systems that were developed to deliver multimedia content to users.

13. In 1994, I began to research issues associated with the development and deployment of a one-to-many communication facility (called “multicast”) in the Internet (first deployed as the Multicast Backbone, a virtual overlay network supporting one-to-many communication). Some of my more recent research endeavors have looked at how to use the scalability offered by multicast to provide streaming media support for complex applications like distance learning, distributed collaboration, distributed games, and large-scale wireless communication. Multicast has also been used as the delivery mechanism in systems that perform

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local filtering (*i.e.*, sending the same content to a large number of users and allowing them to filter locally content in which they are not interested). As part of this research, I looked at how to implement multicast functionality in Internet routers and switches and undertook an extensive analysis of how multicast was being used in the Internet by collecting and analyzing Internet router data.

14. Starting in 1997, I worked on a project to integrate the streaming media capabilities of the Internet together with the interactivity of the web. I developed a project called the Interactive Multimedia Jukebox (IMJ). Users would visit a web page and select content to view. The content would then be scheduled on one of a number of channels, including delivery to students in Georgia Tech dorms via the campus cable plant. The content of each channel was delivered using multicast communication.

15. In the IMJ, the number of channels varied depending on the capabilities of the server including the available bandwidth of its connection to the Internet. If one of the channels was idle, the requesting user would be able to watch their selection immediately. If all channels were streaming previously selected content, the user’s selection would be queued on the channel with the shortest wait time. In the meantime, the user would see what content was currently playing on other channels, and because of the use of multicast, would be able to join one of the existing channels and watch the content at the point it was currently being transmitted.

16. The IMJ service combined the interactivity of the web with the streaming capabilities of the Internet to create a jukebox-like service. It supported true Video-on-Demand when capacity allowed, but scaled to any number of users based on queuing requested programs. As part of the project, we obtained permission from Turner Broadcasting to transmit cartoons and other short subject content. We also attempted to connect the IMJ into the Georgia Tech

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campus cable television network so that students in their dorms could use the web to request content and then view that content on one of the campus’s public access channels.

17. More recently, I have also studied issues concerning how users choose content, particularly when considering the price of that content. My research has examined how dynamic content pricing can be used to control system load. By raising prices when systems start to become overloaded (i.e., when all available resources are fully utilized) and reducing prices when system capacity is readily available, users’ capacity to pay as well as their willingness can be used as factors in stabilizing the response time of a system. This capability is particularly useful in systems where content is downloaded or streamed to users on-demand.

18. As a parallel research theme, starting in 1997, I began researching issues related to wireless devices. In particular, I was interested in showing how to provide greater communication capability to “lightweight devices,” *i.e.*, small form-factor, resource-constrained (*e.g.*, CPU, memory, networking, and power) devices.

19. Starting in 1998, I published several papers on my work to develop a flexible, lightweight, battery-aware network protocol stack. The lightweight protocols we envisioned were similar in nature to protocols like Universal Plug and Play (UPnP) and Digital Living Network Alliance (DLNA).

20. From this initial work, I have made wireless networking—including ad hoc and mesh networks and wireless devices—one of the major themes of my research. One topic includes developing applications for mobile devices, for example, virally exchanging and tracking “coupons” through “opportunistic contact” (i.e., communication with other devices coming into communication range with a user). Other topics include building network communication among a set of mobile devices unaided by any other kind of network

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infrastructure. Yet another theme is monitoring wireless networks, in particular different variants of IEEE 802.11 compliant networks, to (1) understand the operation of the various protocols used in real-world deployments, (2) use these measurements to characterize use of the networks and identify protocol limitations and weaknesses, and (3) propose and evaluate solutions to these problems.

21. As an important component of my research program, I have been involved in the development of academic research into available technology in the market place. One aspect of this work is my involvement in the Internet Engineering Task Force (IETF), including many content delivery-related working groups like the Audio Video Transport (AVT) group, the MBone Deployment (MBONED) group, Source Specific Multicast (SSM) group, the Inter-Domain Multicast Routing (IDMR) group, the Reliable Multicast Transport (RMT) group, the Protocol Independent Multicast (PIM) group, etc. I have also served as a member of the Multicast Directorate (MADDOGS), which oversaw the standardization of all things related to multicast in the IEFT. Finally, I was the Chair of the Internet2 Multicast Working Group for seven years. In many of these efforts, I worked closely with numerous companies, including many in the routing/switching space. As part of my work in the IETF, I also wrote several RFCs and worked to standardize new network management protocols.

22. I am an author or co-author of nearly 200 technical papers, published software systems, IETF Internet Drafts and IETF Request for Comments (RFCs).

23. My involvement in the research community extends to leadership positions for several journals and conferences. I am the co-chair of the Steering Committee for the ACM Network and System Support for Digital Audio and Video (NOSSDAV) workshop and on the Steering Committees for the International Conference on Network Protocols (ICNP), ACM

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Sigcomm Workshop on Challenged Networks (CHANTS), and IEEE Global Internet (GI) Symposium. I have served or am serving on the editorial boards of IEEE/ACM Transactions on Networking, IEEE Transactions on Mobile Computing, IEEE Transactions on Networks and System Management, IEEE Network, ACM Computers in Entertainment, AACE Journal of Interactive Learning Research (JILR), and ACM Computer Communications Review.

24. I have co-chaired a number of conferences and workshops including the IEEE International Conference on Network Protocols (ICNP), ACM International Conference on Next Generation Communication (CoNext), IEEE Conference on Sensor, Mesh and Ad Hoc Communications and Networks (SECON), International Conference on Communication Systems and Networks (COMSNETS), IFIP/IEEE International Conference on Management of Multimedia Networks and Services (MMNS), the International Workshop On Wireless Network Measurement (WiNMee), ACM Sigcomm Workshop on Challenged Networks (CHANTS), the Network Group Communication (NGC) workshop, and the Global Internet Symposium; and I have been on the program committee of numerous conferences.

25. Furthermore, in the courses I teach, the class spends significant time covering all aspects of the Internet including each of the layers of the Open System Interconnect (OSI) protocol stack commonly used in the Internet. These layers include the physical and data link layers and their handling of signal modulation, error control, and data transmission. I also teach DOCSIS, DSL, and other standardized protocols for communicating across a variety of physical media including cable systems, telephone lines, wireless, and high-speed Local Area Networks (LANs).

26. I teach the configuration and operation of switches, routers, and gateways including routing and forwarding and the numerous respective protocols as they are standardized

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and used throughout the Internet. Topics include a wide variety of standardized Internet protocols at the Network Layer (Layer 3), Transport Layer (Layer 4), and above.

27. In addition to having co-founded a technology company myself, I have worked for, consulted with, and collaborated with various technology companies, including IBM, Hitachi Telecom, Digital Fountain, RealNetworks, Intel Research, Cisco Systems, and Lockheed Martin. With many of these companies as well as numerous other companies in similar areas, I interacted with researchers and collaborated with peers at IETF meetings.

28. I am a Member of the Association of Computing Machinery (ACM) and a Fellow of the Institute of Electrical and Electronics Engineers (IEEE).

29. In my 35 years of experience with computer software, I have reviewed innumerable lines of source code written by many different programmers. And as mentioned above, I also teach the configuration and operation of various network devices (switches, routers, gateways), which includes topics related to command line interface computer programs and the technology upon which such programs are based. I also teach network programming classes and assign programming projects that I personally review and grade.

30. As a result of my teaching, I am familiar with variations of command and program expression that arise when a set of engineers and/or programmers are asked to solve a problem. What I have found in my decades of experience is that engineers and programmers find many ways to write commands and programs to express solutions to the same problem.

31. I also am familiar with tools used to assist in the detection of plagiarism or source code copying in a university setting. I have worked with UCSB to develop software tools for detecting plagiarism. For example, I was involved in developing the PAIRwise Plagiarism Detection Systems (“PAIRwise”). PAIRwise is a service that I helped invent that provides a

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variety of functions including comparing assignments against other assignments in a class and comparing assignments against the vast amount of data available on the Internet. The goal is to help professors detect plagiarism in their students’ work.

32. I also have conducted research; co-authored papers; and developed systems to support the detection of plagiarism through document comparison and similarity detection (*see, e.g.,* the papers and systems in my CV, specifically II.A.55, II.A.40, II.B.36, and II.E.15). I have also used tools like CopyFind, PAIRwise, and the Measure of Software Similarity (MOSS) program in my courses.

33. Furthermore, I find programming an expressive, creative endeavor, just like technical writing. In both cases, although there is a purpose to be served, there are many ways to accomplish the goal, and a wide range of expressive choices in doing so.

34. I attach as **Attachment A** my *curriculum vitae*, which includes a more complete list of my qualifications.

**B. Materials Considered**

35. In forming my opinions, I have relied on my education and experience as described above.

36. I have also reviewed and considered the materials cited in this reports as well as the materials listed in **Attachment B** to my opening report, the materials listed in **Attachment C** to this report, and the materials cited in all exhibits to my opening report, all of which are incorporated here by reference.

37. I also have inspected and/or tested the switches, source code, and products set forth in my opening report.

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38. In addition to the materials specifically identified, I may provide further exhibits to be used as a summary of or support for my opinions.

39. As I did in my opening report, I also have relied on conversation I had with Cisco employees including those identified below in this report and those identified in my opening report.

40. I expect to testify at trial regarding the matters addressed in this report and any supplemental or amended report I may submit. I also expect to testify at trial with respect to matters addressed by experts testifying on behalf of Arista. I also may testify on other matters relevant to this case, if asked by the Court or by the parties’ counsel.

41. As I stated above, I have been asked to review the opening expert reports submitted by Dr. Black, Ms. Elsten, and Mr. Seifert on behalf of Arista. I have organized this report into various topics for which Arista’s experts have provided one or more opinions. Arista’s experts provided many similar opinions on the same topics, and so my rebuttals to those opinions are the same whether I specifically mention a particular expert’s opinion or not. For example, all three expert reports that I was asked to review and respond to address the concept of “industry standards.” I address those opinions below, but may not provide specific citations to all places in each of the three reports to which I am responding. My opinions rebutting specific topics apply equally to all similar opinions of Arista’s experts.

### **III. ARISTA’S EXPERT OPINIONS CONFIRM MY OWN OPINIONS**

42. In the hundreds of pages that Arista’s experts collectively submitted, Arista’s experts made various statements (and omissions) that bear on Arista’s copyright infringement in this case. The admissions and omissions not only confirm my opinions that Arista intentionally and “slavishly” copied Cisco’s copyrighted works but further confirm that Cisco’s copyrighted

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works are original, creative, and that they are not and never have been part of any so-called industry standard.

43. For example, Mr. Seifert confirmed that:

■ [REDACTED]

[REDACTED]

[REDACTED]

[REDACTED] [REDACTED] [REDACTED]

■ [REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

44. Dr. Black confirmed that:

■ [REDACTED]

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■ [REDACTED]

[REDACTED]

[REDACTED]

46. I also note that none of Arista’s experts disputed any of the following:

- i. Arista copied Cisco’s IOS technical documentation as set forth in the operative complaint and in my opening report regarding copying;
- ii. Cisco’s IOS technical documentation are creative and original;
- iii. Cisco’s IOS technical documentation is not part of an industry standard nor subject to Arista’s fair use defense, let alone any of its other defenses such as *scenes a faire* or merger;
- iv. Arista copied Cisco’s IOS help descriptions identified in Exhibits G and H to Cisco’s interrogatory responses and in Copying-Exhibit 6 to my opening report (“Cisco help descriptions”);
- v. Cisco’s IOS help descriptions are creative and original<sup>12</sup>;

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vi. Cisco’s IOS help descriptions are not part of an industry standard nor subject to Arista’s fair use defense, let alone any of its other defenses such as *scenes a faire* or merger;

vii. Arista copied Cisco’s IOS help screen;

viii. Cisco’s IOS help screen is creative and original;

ix. Cisco’s IOS help screen is not part of an industry standard nor subject to Arista’s fair use defense, let alone any of its other defenses such as *scenes a faire* or merger;

x. Arista copied hundreds of Cisco’s IOS command responses<sup>13</sup>;

xi. Cisco’s IOS command responses are creative and original<sup>14</sup>; and

xii. Cisco’s IOS command responses are not part of an industry standard nor subject to Arista’s fair use defense, let alone any of its other defenses such as *scenes a faire* or merger.

#### IV. THERE IS NO INDUSTRY STANDARD CLI

47. In my opening report, I provided opinions that there is no industry standard for CLIs and that Cisco’s IOS copyrighted works, including its CLI, are not part of any industry standard.<sup>15</sup> That section of my opening report is incorporated here by reference.

■ [REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

■ [REDACTED]

[REDACTED]

[REDACTED]

<sup>15</sup> See Almeroth Opening Report Section VII.

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48. Arista’s experts have provided their own opinions on this topic, and in this section I provide my analysis and response to those opinions, which I disagree with. In sum, after reviewing all of the evidence cited by Arista’s experts, what I have found is that the evidence put forth by Arista’s experts confirms, contrary to how they attempt to interpret the data, that no industry standard exists.

**A. Background Regarding Existing Technical Standard**

49. A standard is “any set of technical specifications that either provides or is intended to provide a common design for a product or process.”<sup>16</sup> Standard-Setting Organizations (“SSOs”) permit the creation of standard technologies to facilitate the development of products that can work together.<sup>17</sup> As described above, I have been involved in various SSOs (both as a participant, a contributor, and in a leadership capacity) during my career and have extensive experience with the process of standardization. A typical key objective of many SSOs is to facilitate interoperability between devices within a particular technology, including communication technologies such as networking protocols. SSOs coordinate technical standards in various industries, such as the communication and networking industries, where SSOs include (for example) the Internet Engineering Task Force (“IETF”)<sup>18</sup> and the Institute of Electrical and Electronics Engineers (“IEEE”).<sup>19</sup>

50. Standards set forth by SSOs can serve an important function in certain areas of the technology world. For example, parts/components companies (for example, companies making pipe fixtures) must adhere to the standards set by end-user products companies (for example,

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<sup>16</sup> Lemley, Mark, “Intellectual Property Rights and Standard-Setting Organizations,” *California Law Review*, Vol. 90 (2002), p. 1896.

<sup>17</sup> Lemley, Mark, “Intellectual Property Rights and Standard-Setting Organizations,” *California Law Review*, Vol. 90 (2002), pp. 1892-1893.

<sup>18</sup> Getting Started in the IETF (<https://www.ietf.org/newcomers.html>).

<sup>19</sup> <https://www.ieee.org/index.html>

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companies making faucets) to ensure compatibility. Without adherence to the standards, the parts/components will not fit the end-user products, thereby leaving the user with two ineffective products.

51. The same basic principle applies for networking and communications, where different companies make devices and network equipment that must be able to communicate with each other. In fact, the foundation of networking is the ability of two or more devices to communicate with each other over a network. In order to successfully communicate, some mutually agreed-upon means and procedures for communication must be used so that all the devices in the network can understand each other. Because there are many different device manufacturers throughout the world, networking SSOs—like the IETF and IEEE, mentioned above—have been created in order to promulgate a standard set of communication procedures (also referred to as “protocols”) to be used by device manufacturers across many geographical regions. By using the same set of communication procedures in the networking devices, devices from different vendors may interact with each other in order to support data communications.

52. SSOs implement intellectual property rights (“IPR”) policies that establish procedures to address the disclosure and licensing of technologies by their members. SSOs typically request disclosure of the existence of any relevant patents (or other technology) that might be claimed essential to a particular standard, and require the owner to agree in a written assurance that it will license the IPR on “fair, reasonable and non-discriminatory” (“FRAND”) terms. Such IPR policies are meant to protect the technology investments made by industry participants relying on established standards and to mitigate the risk of infringing on standard-essential intellectual property. In my experience, many SSO IPR policies generally include the commitment to grant licenses to essential IPR for compensation to the IPR owner—they do not

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mean that the IPR owner must give out its IPR for free or provide a royalty-free license. This is true, for example, of the IPR policies of two organizations with which I am familiar, the IETF and the IEEE Standards Association. So even if IPR is included as part of a standard, an IPR owner is entitled to compensation if others use that IPR. “Fair” does not mean “free.” Furthermore, a participant in standards development does not lose its rights in its IPR just because the IPR becomes part of a standard. Indeed, the IETF clearly states that, “Contributors to the IETF (or their employers) retain ownership of the copyright in their Contributions.”<sup>20</sup>

**B. There is no dispute that no standards body has adopted an industry standard for CLIs.**

53. I note that none of Arista’s experts who opined on industry standard issues provided an opinion that there was an industry standard for CLIs that has been adopted by any SSO. Nor did Arista’s experts provide any opinions or put forth any evidence that Cisco’s IOS CLI is part of an industry standard—such as one from the IETF or the IEEE—or that Cisco ever attempted to make its IOS CLI into an industry standard. These facts are not disputed.

**C. Arista’s experts’ claim of a “de facto” industry standard is wrong.**

54. All three of Arista’s experts contend that there is something called a “de facto” industry standard CLI, and that Cisco’s IOS CLI is that “de facto” standard. I disagree. As I stated in my opening report, there is a great amount of diversity in the industry with respect to CLIs and command implementation, and I incorporate those opinions by reference.<sup>21</sup> Furthermore, as discussed in my opening report and below, most industry standards are focused

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<sup>20</sup> <https://tools.ietf.org/html/rfc5378#page-8> (Section 3.6).

<sup>21</sup> Almeroth Opening Report Paras. 119, 120, 244, 245.

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☐ \_\_\_\_\_

[illegible]

<sup>28</sup> Almeroth Opening Report Para. 252.

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<sup>29</sup> Seifert Para. 67.

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████████ Cisco has sued to enforce its copyrights over its CLI in the past, confirming that Cisco

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[REDACTED]

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has always believed that its copyrighted works and IOS CLI are proprietary to Cisco. In fact, when Cisco learned that Huawei copied Cisco’s IOS CLI, Cisco sued Huawei for copyright infringement, and Huawei was forced to change its CLI as a result of that litigation.<sup>32</sup> The same is true here. When Cisco learned of Arista’s widespread infringement, it sued to enforce its property rights.<sup>33</sup> And the intellectual property rights at issue here are not just commands, [REDACTED] [REDACTED]—Cisco has alleged (and I have found) widespread copying of technical documents, command outputs, hierarchies, modes, prompts, and help screens—which shows that Arista has copied the entire look and feel of Cisco’s IOS CLI.

[REDACTED]  
[REDACTED]  
[REDACTED] As I stated in my opening report, it is my opinion, and all of the available evidence indicates, that the Cisco copyrighted work including Cisco’s IOS CLI are original works. As I explained in my opening report, Cisco has provided an incredible amount of detailed evidence showing that even down to the asserted multi-word command expressions, Cisco created them as well as the documentations, hierarchies, modes, prompts, screen outputs, and help descriptions associated with Cisco’s IOS CLI.

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[REDACTED]  
[REDACTED]  
[REDACTED]  
[REDACTED]  
[REDACTED]  
[REDACTED]  
[REDACTED]  
[REDACTED]  
[REDACTED]  
[REDACTED]  
[REDACTED]  
[REDACTED]

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[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

2. **Elsten**

67. Arista also submitted a report from Ms. Elsten who—although she has no technical expertise—opined and commented on certain “industry standard” issues. I disagree with Ms. Elsten’s opinions and comments.

[REDACTED]

[REDACTED]

[REDACTED] I disagree. I have not seen any evidence that any competitor in the “relevant market” has engaged in widespread,

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<sup>35</sup> <http://computemagazine.com/the-history-of-the-ibm-personal-computer/>.

<sup>36</sup> Elsten at 28.

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intentional copying like Arista has. [REDACTED]

[REDACTED]

[REDACTED]

[REDACTED] And command expressions are just one of Cisco’s copyrighted works that Arista copied. Ms. Elsten does not account for the other copyrighted elements Arista copied to create a clone of Cisco’s user interface, nor does she address whether she believes others in the market also copied those elements.

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED] To suggest that Arista’s

copying might be acceptable based on a nearly exclusive focus counting command expressions

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<sup>37</sup> Elsten at 29.

<sup>38</sup> Elsten at 32.

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thus ignores the intentional copying of the entire look and feel of IOS, as well as all of the other elements that Arista copied beyond the commands.

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED] it ignores that, for example, there are many single word/letter/character commands that are irrelevant to the case because all of the commands at issue here are multi-word command expressions; and it ignores that today’s version of EOS is merely a derivation of the original EOS versions that show copying in some instance of over 60%, which shows that what Arista copied was important to Arista. I provide further details on this topic below in connection with my discussion of Dr. Black’s report.

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

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<sup>39</sup> Elsten at 34.

<sup>40</sup> Elsten at 34.

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[REDACTED]

[REDACTED]

[REDACTED] More importantly, CLIs do not provide indications of expectations, period. As I explained above and in my opening report, there is no need for an industry standard CLI. And that is evident by the fact that no SSO has ever adopted one, and there is diversity among CLIs. In my opinion, the message to the networking industry from the SSOs is clear: you can use the industry standard networking protocols to interoperate, but you are free to develop your own user interfaces (whether it is CLI or GUI or another type of interface) to compete in the marketplace and offer distinct value propositions to customers.<sup>41</sup>

[REDACTED]

[REDACTED] I disagree with Ms. Elsten’s opinions and comments. [REDACTED]

[REDACTED]

Since I explained why Mr. Seifert is wrong above, I incorporate those critiques and opinions here by reference. [REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

---

<sup>41</sup> Almeroth Opening Report Section VII (discussing various interface options vendors can employ).

[REDACTED]

[illegible]

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[illegible]

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[illegible]

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reasons stated above and in my opinion report (which are incorporated here by reference), I disagree.

**D. The data that Arista’s experts rely on disproves their theory that a “de facto” industry standard exists.**

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED] I

disagree with both Mr. Seifert and Dr. Black.

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

Nevertheless, for purposes of my response I will assume that Dr. Black's calculations are accurate and reflect the multi-word command expressions that Arista copied, unless otherwise noted below.

[illegible]

\_\_\_\_\_  
 [Redacted]  
 [Redacted]

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[REDACTED]

81. There are various problems with Dr. Black’s data and methodology. To start, based on my review of the materials in this case and my knowledge of the switching industry and switching vendors, Dr. Black has omitted at least 20 switching vendors from his analysis (if not more – this is a conservative estimate and does not even include all routing vendors). This is important because it represents a significant percentage of the “industry.” Accordingly, in my opinion none of Dr. Black’s opinions about “industry standard” CLIs or command expressions, hierarchies, modes, and prompts (etc.) are statistically relevant. If one assumes for the sake of argument that there are 20 vendors omitted (a conservative estimate), [REDACTED]

[REDACTED] As such, none of his opinions about an “industry standard” CLI can possibly be accurate because he failed to actually survey the industry. Instead, he surveyed a self-selected fraction of it.

82. [REDACTED]

Age Group	Should Take Action (%)	Should Not Take Action (%)
18-29	85	15
30-49	85	15
50-69	85	15
70+	85	15

\_\_\_\_\_

□ ☐ ☐

<sup>53</sup> Because Dr. Black appears to have combined multiple different vendors and counted them as a “single” vendor to perform his analysis, this is based on my best efforts to parse through his analysis. What Dr. Black seems to have done is combine different vendors’ products so long as at some point the vendors merged.

34

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[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

86. Dr. Black never explains why he ignored or chose to analyze a subset of the vendors he and Arista identified. The only reasonable conclusion is that he did not address those other vendors because the data from them was worse than the data Dr. Black relied on to support his opinions. [REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

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[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]		[REDACTED]	
[REDACTED]		[REDACTED]	
	[REDACTED]		[REDACTED]
	[REDACTED]		[REDACTED]
	[REDACTED]		[REDACTED]
	[REDACTED]		[REDACTED]
	[REDACTED]		[REDACTED]
	[REDACTED]		[REDACTED]
	[REDACTED]		[REDACTED]

<sup>56</sup> Black Para. 127.

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90. This does not support Dr. Black’s opinions. To the contrary, it supports my opinion that there is no industry standard CLI.

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

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[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

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[REDACTED]

[REDACTED]

[REDACTED]	
[REDACTED]	
[REDACTED]	[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

<sup>59</sup> Furthermore, as I stated in my opening report, Arista copied numbers commands from non-IOS operating systems that Arista does not believe are “industry standard.” This is further proof that Arista did not merely use an “industry standard” CLI but instead focused on slavishly copying Cisco. Almeroth Opening Report Paras. 242-244.

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[illegible]

- [REDACTED]  
 ■ [REDACTED]  
 ■ [REDACTED]  
 ■ [REDACTED]  
 ■ [REDACTED]

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98. As I explained in my opening report, Arista's executives and employees have admitted to slavishly copying Cisco, which makes Arista unique. [REDACTED]

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\_\_\_\_\_

## V. CREATIVITY AND ORIGINALITY

99. Arista's experts also opined and commented on the creativity and originality of Cisco's copyrighted works and the IOS CLI, largely focusing on command expressions as

<sup>65</sup> Dell Deposition Tr. at 113:18-21, 114:4-16.

<sup>66</sup> *Id.* at 116:23-117:7 (objections omitted).

### A. Creativity

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\_\_\_\_\_

\_\_\_\_\_

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[illegible]

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[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

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<sup>69</sup> Almeroth Opening Report Paras. 50-52, 101-117, 121.

<sup>70</sup> Almeroth Opening Report Paras. 101-120.

<sup>71</sup> Almeroth Opening Report Paras. 101-120.

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

<sup>73</sup> Almeroth Opening Report Para. 110, 112.

<sup>74</sup> *E.g.*, Almeroth Opening Report Para. 118.

<sup>75</sup> *Id.*

[REDACTED]

[REDACTED]



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[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

```
Switch>help
Help may be requested at any point in a command by entering
a question mark '?'. If nothing matches, the help list will
be empty and you must backup until entering a '?' shows the
available options.
Two styles of help are provided:
1. Full help is available when you are ready to enter a
  command argument (e.g. 'show ?') and describes each possible
  argument.
2. Partial help is provided when an abbreviated argument is entered
  and you want to know what arguments match the input
  (e.g. 'show pr?')
```

(Cisco's IOS Help Screen)

```
localhost#help
Help may be requested at any point in a command by entering
a question mark '?'. If nothing matches, the help list will
be empty and you must backup until entering a '?' shows the
available options.
Two styles of help are provided:
1. Full help is available when you are ready to enter a
  command argument (e.g. 'show ?') and describes each possible
  argument.
2. Partial help is provided when an abbreviated argument is entered
  and you want to know what arguments match the input
  (e.g. 'show pr?'.)

localhost#
```

(Arista's Identical EOS Help Screen)

<sup>79</sup> *Id.* at 217:12-218:8.

<sup>80</sup> *E.g.*, Black Para. 192.



[illegible]

<sup>84</sup> *E.g.*, Almeroth Opening Report Para. 107; Remaker Deposition Tr. at 29:18-31:18.

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[REDACTED]

The document called the “Manifesto” itself is merely a set of “guidelines” and “best practices” for the creation of new commands.<sup>86</sup> It is not a rule book that explains how commands must be created—it provides stylistic suggestions.<sup>87</sup> [REDACTED]

[REDACTED]

[REDACTED]

109. In sum, no standard, protocol, RFP or other technical document dictates the expression of a command expression or the content of any hierarchy, technical document, display screen, help screen, prompt, or mode. Arista’s experts have come forward with no such evidence, and I am not aware of any such evidence.

**B. Originality**

[REDACTED]

[REDACTED]

<p>[REDACTED]</p> <p>[REDACTED]</p> <p>[REDACTED]</p> <p>[REDACTED]</p>	<p>[REDACTED]</p>
<p>[REDACTED]</p> <p>[REDACTED]</p> <p>[REDACTED]</p> <p>[REDACTED]</p> <p>[REDACTED]</p> <p>[REDACTED]</p>	<p>[REDACTED]</p>

[REDACTED]

[REDACTED]

<sup>86</sup> Remaker Deposition Tr. at 27:11-18:2, 37:4-7; CSI -CLI- 00754391 (“in practice parser -police has no formal ‘clearing’ criteria”; encouraging engineering to “think” and “envision” when developing commands; using dashes instead of underscores “is a purely aesthetic thing”).

<sup>87</sup> *Id.*

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<p>[REDACTED]</p> <p>[REDACTED]</p> <p>[REDACTED]</p> <p>[REDACTED]</p> <p>[REDACTED]</p> <p>[REDACTED]</p> <p>[REDACTED]</p>	<p>[REDACTED]</p> <p>[REDACTED]</p>
<p>[REDACTED]</p> <p>[REDACTED]</p> <p>[REDACTED]</p> <p>[REDACTED]</p>	<p>[REDACTED]</p>
<p>[REDACTED]</p> <p>[REDACTED]</p>	<p>[REDACTED]</p>
<p>[REDACTED]</p> <p>[REDACTED]</p>	<p>[REDACTED]</p>

112. I disagree with both of Arista's experts for various reasons. To start, neither expert addresses the fact that Cisco provided a significant amount of evidence establishing the originality and creation of Cisco's copyrighted works including its IOS CLI.<sup>88</sup>

<sup>88</sup> Almeroth Opening Report Para. 260.

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## VI. SCENES A FAIRE, MERGER & SHORT PHRASES

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dictated by extrinsic considerations such as the mechanical specifications of the computer on which a particular program is intended to run, or widely accepted programming practices within the computer industry. I further understand that *scenes a faire* is evaluated at the time of creation of the expression.

119. I have been informed that under the merger doctrine, courts will not protect a copyrighted work from infringement if the idea underlying the allegedly infringed copyrighted work can be expressed in only one way. The merger doctrine provides that, when there are a very limited number of ways to express an idea, the idea may be said to “merge” with its expression, and the expression may not be protected as a result. I further understand that a merger defense is evaluated at the time of creation of the alleged expression, and not at the time of the infringement.

120. Finally, I have been informed that where an entire work is only an individual word or a short phrase such as a name, title, or slogan it may not be subject to copyright protection under the short phrases doctrine, unless it exhibits sufficient creativity. I also understand that not all courts apply this doctrine and those that apply it do not extract short phrases from the work as a whole in conducting the analysis (as Arista’s experts have done), but I discuss it here for the sake of completeness.

[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED]
[REDACTED]	

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[illegible]

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[illegible]

122. I disagree with Dr. Black for the reasons stated in my opening report and in my discussion above that the Cisco copyrighted works in this litigation are original, creative, and expressive. All of my opinions (already expressed) apply here because Dr. Black makes no new arguments in his discussions on *scenes a faire*, merger, and short phrases.

123. As I stated above, even if the Cisco copyrighted works do relate to or perform a function or method, I understand that does not mean that they are not protectable by copyright. All computer programs perform functions and methods, and I understand those are protectable works under the law. Nevertheless, as I have previously stated, there is nothing necessarily or purely functional about Cisco’s copyrighted works.<sup>93</sup> They are not necessarily directed to any “method” either. Neither are there any constraints on what can be included in a command expression, hierarchy, or any of the other copyrighted elements at issue in this case.<sup>94</sup> None of the elements of the Cisco’s copyrighted works are “names, titles, and slogans.”

<sup>93</sup> See *infra* Para. 45.f.; Almeroth Opening Report Para. 118.

<sup>94</sup> Almeroth Opening Report Para. 101-118.

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124. Further, with respect to command expressions—the

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Age Group	Percentage
18-24	15
25-34	85
35-44	90
45-54	95
55-64	100
65-74	35
75-84	15
85+	35
Don't know	45

126. For these reasons—as well as the reasons stated in my opening report and in this report—I disagree that the doctrines of *scenes a faire*, merger, or “short phrases” are applicable here.

127. I understand that Arista asserts as an affirmative defense the doctrine of “fair use.” I have been informed that a defendant may reproduce another’s copyrighted work if doing so constitutes fair use. I understand in determining whether the use made of a work is a fair use, courts consider: 1. the purpose and character of the use, including whether such use is of a commercial nature or is for nonprofit educational purposes; 2. the nature of the copyrighted work; 3. the amount and substantiality of the portion used in relation to the copyrighted work as a whole; and 4. the effect of the use upon the potential market for or value of the copyrighted

[REDACTED]  
 [REDACTED]  
 [REDACTED]  
 [REDACTED]

56

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work. I also understand that a defendant (here, Arista) has the burden of proving this defense by a preponderance of the evidence.

\_\_\_\_\_

\_\_\_\_\_

[illegible]

\_\_\_\_\_

\_\_\_\_\_

[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]
[REDACTED]	

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130. I disagree with Dr. Black’s and Ms. Elsten’s opinions and conclusions for various reasons, as explained below.

**A. “The purpose and character of the use, including whether such use is of a commercial nature or is for nonprofit educational purposes.”**

131. I start by noting that neither Dr. Black nor Ms. Elsten contend that Arista’s use of Cisco’s copyrighted works is for one of the enumerated fair use purposes that is protected by the copyright laws—criticism, comment, news reporting, teaching (including multiple copies for classroom use), scholarship, or research. Neither expert contends that Arista uses Cisco’s copyrighted works for educational purposes or, on the other hand, that Arista does not use Cisco’s copyrighted works for a “commercial” purpose.

132. It also is my understanding that Arista is a for-profit business and does, in fact, use Cisco’s copyrighted works for a commercial purpose.<sup>98</sup> As I explained in my opening report, I understand that Arista provides products, software, and technical support incorporating Cisco’s copyrighted works to its distributors and/or customers so that they use Arista’s EOS and its CLI.<sup>99</sup> As I also explained in my opening report, Arista knows that its distributors and customers purchase its products to use, reproduce, distribute, and/or publicly display EOS.<sup>100</sup> For example, Arista has stated that at least 80% of its customers consider the EOS CLI (which incorporates

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<sup>98</sup> CSI-CL-02099053; CSI-CLI-00355093; CSI-CLI-00355164; CSI-CLI 00358000; CSI-CLI-01300636.

<sup>99</sup> Almeroth Opening Report Para. 256.

<sup>100</sup> *Id.* at Paras. 257-258.

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Cisco’s copyrighted works) to be an important factor in their decisions to purchase Arista’s products.<sup>101</sup> Arista also markets the similarity between its products and Cisco’s copyrighted works in marketing and other public materials as a selling point for customers.<sup>102</sup> And, as I explained in my opening report, Arista also provides training and support specifically for its EOS CLI.<sup>103</sup>

133. I have seen nothing that would suggest to me that Arista’s use of Cisco’s copyrighted works is different in any way than Cisco’s use of those works. The purpose of Arista using Cisco’s copyrighted works is the same as Cisco’s. Arista has used and continues to use Cisco’s copyrighted works in the same type of software as Cisco (a network device operating system), with the same general type of hardware as Cisco (network devices, including switches and routers), to perform many of the same functions as Cisco (routing and switching), and sells to customers in the same or similar ways as Cisco. In fact, Arista’s CEO views Cisco as a “fierce competitor” in the market,<sup>104</sup> and if a customer were to purchase an Arista device with EOS they would (to my knowledge) have no reason to also purchase a Cisco device with IOS for the same application. Thus, in my opinion Cisco’s copyrighted works and Arista’s EOS operating system are used for the same purpose.

134. Further, in my opinion Arista’s use of Cisco’s copyrighted works is not “transformative” because Arista has not created anything new out of Cisco’s copyrighted works. Arista has instead admittedly and “slavishly” copied Cisco’s copyrighted works, in many cases word-for-word, even copying grammatical errors and/or commands that Arista believed to be

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<sup>101</sup> *Id.* Para. 75.

<sup>102</sup> *Id.* at Paras. 75, 257.

<sup>103</sup> *Id.* at Para. 77, 256.

<sup>104</sup> *Id.* at Para. 69; CSI-CLI-00357842 at CSI-CLI-00357851

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inferior to available alternatives (as I explained in my opening report).<sup>105</sup> Arista also uses at least the command expressions for an identical purpose of providing the command-line interface to a networking device that competes directly with Cisco’s networking devices.<sup>106</sup>

135. Arista also has explained that it saved development costs by copying Cisco’s copyrighted works: “Since I helped build the enterprise, I would never compete with Cisco directly in the enterprise in a conventional way. It makes no sense. It would take me 15 years and 15,000 engineers, and that’s not a recipe for success.”<sup>107</sup> Arista has further explained that its use of Cisco’s copyrighted CLI was to compete directly with Cisco:

“[A] Cisco CCIE expert would be able to use Arista right away, because we have a similar command-line interface and operational look and feel. Where we don’t have to invent, we don’t.”<sup>108</sup>

Arista has learned to “[p]rovide familiar interfaces to ease adoption” including a “standard CLI that ... retains familiar management commands” so much so that “80% [of Arista customers] tell us they appreciate the way they can leverage their deep [Cisco] IOS experience, as they can easily upgrade an aging [Cisco] Catalyst infrastructure to Arista.”<sup>109</sup>

“Familiar management interfaces, standard CLI ... It’s been very helpful for our customers to be able to rapidly adopt our products and integrate them into their

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<sup>105</sup> Almeroth Opening Report, Section VI Evidence of Copying.

<sup>107</sup> See, e.g., Adam Lashinsky, “An Ex-Cisco Exec Reflects,” *Fortune* (Mar. 20, 2014), available at <http://fortune.com/2014/03/20/an-exciscoexec-reflects/>.

<sup>108</sup> John Gallant, “How Arista Networks Got Out In Front of the SDN Craze,” *Network World* (Feb. 22, 2013).

<sup>109</sup> Posting of Kenneth Duda to Arista EOS Central, “Linux as a Switch Operating System: Five Lessons Learned” (Nov. 5, 2013), available at <https://eos.arista.com/linux-as-a-switch-operating-system-five-lessons-learned/>.

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environments ... that our switches provide a familiar management interface so their existing tools and processes, screen scraping, automation, continue to work just as they did before.”<sup>110</sup>

“The familiar EOS command-line interface (CLI) avoids retraining costs.”<sup>111</sup>

[REDACTED]

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<sup>110</sup> Arista, *EOS Bits & Bytes - Episode 1 - Lessons Learned While Building a Network OS on Top of Linux*, Arista EOS Central - Video Library (Jan. 30, 2014), at 6:55–7:56, available at <http://eos.arista.com/wpcontent/themes/aristaeos/video-lightbox.php?vid=ttp6lavHKGo>.

<sup>111</sup> Arista, *EOS: An Extensible Operating System*.

[REDACTED]

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137. In fact, Arista has produced evidence in this case indicating that it copied not just the CLI interface and related elements from Cisco, but that it copied numerous features from Cisco’s competing products in order to create Arista products that compete directly with Cisco.<sup>113</sup> In [REDACTED]

[REDACTED]

[REDACTED]

[REDACTED] All of this undisputed evidence of Arista’s intentional copying of Cisco’s features and CLI interface design demonstrates that Arista has acted willfully in a competitive manner and did not engage in a “transformative” use of the copyrighted works from Cisco. To the contrary, Arista used Cisco’s copyrighted works in products that compete directly with Cisco using the same “look and feel” and largely similar set of product features, which were also copied from Cisco, in order to take customers away from Cisco. It is my opinion that this type of use is not transformative in nature and that it reveals the impropriety of Arista’s conduct.

138. There is additional evidence that I have seen that suggests to me that Arista acted willfully to compete with Cisco, not to transform the use of Cisco’s CLI in a fundamentally different way. [REDACTED]

[REDACTED]

---

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

<sup>114</sup> E.g., Almeroth Opening Report Paras. 135-154.

[REDACTED]

[REDACTED]

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[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

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[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

139. In my opinion Arista's CTO's blog postings also confirm that Arista's corporate leaders do not respect other company's intellectual property rights and, in fact, encourage others to act as Arista has here.<sup>129</sup>

124 ARISTANDCA10499890.  
125 ARISTANDCA1199299.  
126 ARISTANDCA 10537469-ARISTANDCA 10537470.  
127 CSI-CLI-00357842 at CSI-CLI-00357849 (emphasis added).  
128 Ullal Dep. (ITC) Tr. at 58:1–12, 61:22–25.  
129 *See, e.g.*, <http://www.arista.com/blogs/?p=1301>;  
<http://www.arista.com/blogs/?p=1169>; <http://www.arista.com/blogs/?p=1096>

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140. In my opening report and in this report (*supra*), I have explained in great detail that it is my opinion that Cisco’s copyrighted works are the subject of substantial creativity and expression; that the Cisco copyrighted works are not “industry standard”; that the Cisco copyrighted works are not required for interoperability or for interacting with routers or switches from different vendors; and that Cisco has always maintained that its copyrighted works are proprietary. Accordingly, I incorporate all of those opinions here by reference as they relate to the “nature of the copyrighted work” factor.

**C. “The amount and substantiality of the portion used in relation to the copyrighted work as a whole”**

141. I have been informed that the analysis under this factor can take into account both qualitative and quantitative copying. I further understand and have been informed that copying key expressions from a work, *e.g.*, those that may be the “heart and soul” of a work, is a consideration as well even if the quantitative amount may not be large. I further understand that individual elements or components of registered copyrights can constitute, for purposes of fair use, their own works.

142. In my opinion, Arista has copied a substantial portion of the copyrighted works at issue in this case, both quantitatively and qualitatively. Arista has made a number of statements that confirm my opinions. For example, Arista’s CEO has specifically and publicly acknowledged substantial copying since Arista has cloned the “look and feel” of the copyrighted works: “[A] Cisco CCIE expert would be able to use Arista right away, because we have a similar command-line interface and operational look and feel. Where we don’t have to invent,

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we don’t.”<sup>130</sup> Arista’s co-founder and current Chief Technology Officer Kenneth Duda likewise stated that Arista aimed to “[p]rovide familiar interfaces to ease adoption” including a “standard CLI that ... retains familiar management commands” so much so that “80% [of Arista customers] tell us they appreciate the way they can leverage their deep [Cisco] IOS experience, as they can easily upgrade an aging [Cisco] Catalyst infrastructure to Arista.”<sup>131</sup> Mr. Duda has further confirmed that a substantial amount of Cisco’s copyrighted works were intentionally copied by Arista: “Familiar management interfaces, standard CLI ... It’s been very helpful for our customers to be able to rapidly adopt our products and integrate them into their environments ... that our switches provide a familiar management interface so their existing tools and processes, screen scraping, automation, continue to work just as they did before.”<sup>132</sup> In fact, when asked “[i]f [customers] just want to take the [Arista] switch, just as they’re used to, take it out of the box, plug in your console, whatever, SSH in, it’s no different,” Mr. Duda answered in the affirmative—”Yeah.”<sup>133</sup> [REDACTED]

[REDACTED]

[REDACTED]

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<sup>130</sup> See, e.g., John Gallant, “How Arista Networks Got Out In Front of the SDN Craze,” *Network World* (Feb. 22, 2013).

<sup>131</sup> See, e.g., Posting of Kenneth Duda to Arista EOS Central, “Linux as a Switch Operating System: Five Lessons Learned” (Nov. 5, 2013), *available at* <https://eos.arista.com/linux-as-a-switchoperating-system-five-lessons-learned/>.

<sup>132</sup> See, e.g., Arista, *EOS Bits & Bytes - Episode 1 - Lessons Learned While Building a Network OS on Top of Linux*, Arista EOS Central - Video Library (Jan. 30, 2014), at 6:55–7:56, *available at* <http://eos.arista.com/wp-content/themes/aristaeos/video-lightbox.php?vid=ttp6lavHKGo>.

<sup>133</sup> See, e.g., Arista, *EOS Bits & Bytes - Episode 1 - Lessons Learned While Building a Network OS on Top of Linux*, Arista EOS Central - Video Library (Jan. 30, 2014), at 8:12–22, *available at* <http://eos.arista.com/wp-content/themes/aristaeos/video-lightbox.php?vid=ttp6lavHKGo>; see, e.g., Arista, *EOS: An Extensible Operating System* (“[t]he familiar EOS command-line interface (CLI) avoids retraining costs.”).

[REDACTED]

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[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

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<sup>135</sup> ARISTANDCA10499890 at ARISTANDCA10499893.

<sup>136</sup> ARISTANDCA 12060827.

<sup>137</sup> ANI-ITC-944\_945-3599339.

<sup>138</sup> *Id.* at ARISTANDCA10499891.

<sup>139</sup> *Id.* at ARISTANDCA10499890.

<sup>140</sup> ARISTANDCA10499890.

<sup>141</sup> ARISTANDCA 10537469-ARISTANDCA 10537470.

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[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

145. In sum, by copying the “look and feel” of Cisco’s IOS CLI, Arista copied a qualitatively significant portion of the works at issue—indeed, as I stated earlier, a user sitting in front of an Arista CLI would have a hard time knowing that they were not actually using a Cisco CLI. The interface, displays, command expressions, and help descriptions are identical or very similar, which gives the user the entire “look and feel” of Cisco’s IOS CLI.

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<sup>142</sup> ANI-ITC-944\_945-3452526.

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146. I further note that the “registered” works comprise IOS computer programs as well as documentation.<sup>143</sup> As I explained in my opening report, in creating Arista’s documentation, Arista copied extensively from Cisco IOS documentation.<sup>144</sup> In many cases, Arista copied portions of text verbatim from Cisco IOS documentation, even in some instances including grammatical errors.<sup>145</sup> Arista also copied multi-word command expressions in its documents as well as screen outputs. [REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

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<sup>143</sup> Almeroth Opening Report Para. 97.

<sup>144</sup> Almeroth Opening Report Paras. 135-154; *e.g.*, Arista Networks EOS User Manual Version 4.4.0 (CSI-CLI-00007473), Arista Networks EOS User Manual Version 4.0.1 (CSI-CLI-00007244), Arista Networks EOS User Manual Version 4.6.2 (CSI-CLI-00006858), Arista Networks EOS User Manual Version 4.10.0 (CSI-CLI-00007841), Arista Networks EOS User Manual Version 4.11.1 - Rev. 2 (CSI-CLI-00010517), Arista Networks EOS User Manual Version 4.11.2.1 (CSI-CLI-00008985), Arista Networks EOS User Manual Version 4.12.4 (CSI-CLI-00014141), Arista Networks EOS User Manual Version 4.13.7M (CSI-CLI-00011973), Arista Networks EOS User Manual Version 4.14.3F - Rev. 2 (CSI-CLI-00018146), Arista Networks EOS User Manual Version 4.14.5F Rev. 2 (CSI-CLI-00000084), Arista Networks EOS User Manual Version 4.14.6M (CSI-CLI-00004616), Arista Networks EOS User Manual Version 4.15.OF - Rev. 2.27 (CSI-CLI-00020575), Arista Networks EOS User Manual Version 4.15.OF (CSI-CLI-00002332), Arista Networks EOS User Manual Version 4.13.6F (CSI-CLI-00016001).

<sup>145</sup> Almeroth Opening Report Para. 160-167.

[REDACTED]



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I have attempted to remove duplicates and non-multi-word outputs. Furthermore, not all of these are identical matches; for those that are not identical, they are at least within a 75% hit range on a per command help description basis, which in my opinion shows copying as well. Furthermore, these are significant because they are not only evidence that Arista copied output displays [REDACTED]

[REDACTED] Lastly, the 579 total does not account for the examples I provided in my report starting at Paragraph 127 that are not listed in Exhibit-6, which account for roughly 30 additional examples, which brings the total to 609.

b. With respect to output displays, Exhibit-3 to my opening report lists 37 different examples of copied outputs, and I also included the copied “help screen” in my opening report, which raises the total of exemplary output displays copied to 38.

However, I note that these displays were copied into 11 different Arista user manuals<sup>153</sup> and from 18 unique Cisco documents over time.<sup>154</sup> So, in total, there are 324 instances of

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<sup>153</sup> Arista User Manual v. 4.10.0 (7/19/2012); Arista User Manual v. 4.11.1 – Rev 2 (1/22/2013); Arista User Manual v. 4.11.2.1 (3/1/2013); Arista User Manual v. 4.12.4 (9/16/2013); Arista User Manual v. 4.13.6F (4/14/2014); Arista User Manual v. 4.13.7M (6/17/2014); Arista User Manual v. 4.14.3F – Rev. 2 (10/2/2014); Arista User Manual v. 4.14.5F – Rev. 2 (12/22/2014); Arista User Manual v. 4.14.6M (1/19/2015); Arista User Manual v. 4.15.0F (4/18/2015); Arista User Manual v. 4.15.0F – Rev. 2 (4/27/2015).

<sup>154</sup> Cisco Configuration Fundamentals Configuration Guide, Cisco IOS Release 15M&T (2013); Cisco IOS Asynchronous Transfer Mode Command Reference (2011); Cisco IOS Asynchronous Transfer Mode Command Reference (2013); Cisco IOS Interfaces and Hardware Component Command Reference (2013); Cisco IOS IP Addressing Services Command Reference at 22 (2011); Cisco IOS IP Routing Protocols Command Reference, Release 12.4 (2005), at IP2R-553; Cisco IOS IP Routing:OSPF Command Reference (2013); Cisco IOS Multicast Command Reference at 625 (2013); Cisco IOS Security Command Reference Commands S to Z (July 2011); Cisco IOS SNMP Support Command Reference (2011); Cisco IOS SNMP Support Command Reference (2013); Cisco Nexus 7000 Series NX-OS Interfaces Command Reference (August 2013); Cisco Nexus 7000 Series NX-OS Multicast Routing Command Reference (August 2013); Cisco Nexus 7000 Series NX-OS Multicast Routing

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Arista copying these 37 outputs into its documents in addition to copying them into EOS itself. I also note that I provided additional examples of similar outputs in my opening report that Arista created for a sale presentation.<sup>155</sup> These examples further confirm the large amount of copying.

c. With respect to the copying of Cisco’s technical documents (excluding the outputs discussed previously), Exhibit-1 to my opening report shows roughly 531 copying examples from 107 unique Cisco documents. In total, Exhibit-1 shows 2522 instances of Arista copying Cisco’s technical documents.

d. Arista copied 8 out of 8 modes in 15 different versions of EOS, as shown in Exhibit-4 to my opening report.

e. Arista copied 8 out of 8 prompts in 15 different versions of EOS, as shown in Exhibit-4 to my opening report.

f. Arista copied 11 command expression hierarchies across 15 different versions of EOS, as shown in Exhibit-5 to my opening report.

[REDACTED]

[REDACTED]

[REDACTED]

- [REDACTED]

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Configuration Guide (2012); Cisco Nexus 7000 Series NX-OS Security Command Reference (August 2013), at SEC-661; Cisco Nexus 7000 Series NX-OS System Management Command Reference (August 2013); Cisco Nexus 7000 Series NX-OS System Management Command Reference, Release 5.x (April 2010); Cisco Nexus 7000 Series NX-OS Unicast Routing Command Reference (August 2013).

<sup>155</sup> Almeroth Opening Report Para 219 (citing ARISTANDCA1224429).

[REDACTED]

[REDACTED]

[REDACTED]

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- [REDACTED]
- [REDACTED]
- [REDACTED]
- [REDACTED]
- [REDACTED]
- [REDACTED]

150. Industry analysts have confirmed my opinions as well. An article published in CRN in 2014 stated: “[Arista] created a CLI [command-line interface] that looks and acts very much like Cisco’s ...there are a lot of folks out there that are proficient with the Cisco command-line and user interface. Arista is a real natural fit for them.”<sup>163</sup> Another third-party commented

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<sup>157</sup> ANI-ITC-944\_945-3473603 (Sadana Deposition, at Exhibit 365) (emphasis added). In 2010, Arista created its own versions of certain documentation.

<sup>158</sup> ARISTANDCA12228912-28, at 21 (emphasis added).

<sup>159</sup> ARISTANDCA12228912-28, at 22 (emphasis added).

<sup>160</sup> ARISTANDCA12228912-28, at 27 (emphasis added). *See also*, ARISTANDCA13009582-610, at 588.

<sup>161</sup> *See* ARISTANDCA13616527-58, at 50 (emphasis added). *See also*, ARISTANDCA13664355-85, at 79; ARISTANDCA13660035-81, at 52; ARISTANDCA13616311-60, at 36; ARISTANDCA13626648-97, at 65; ARISTANDCA13640583-721, at 594; ARISTANDCA13683317-94, at 73.

<sup>162</sup> ARISTANDCA12260617 (emphasis added).

<sup>163</sup> <http://www.crn.com/print/news/networking/300073307/arista-partners-our-business-is-booming-as-competition-with-cisco-heats-up.htm?page=0%2C1> (viewed 5/18/2016) (emphasis added).

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[REDACTED]

[REDACTED]

[REDACTED] I have analyzed Arista’s user manuals for all versions of EOS at issue, and what I have found is that there is substantially more overlap than that—in some cases 100x more. What my analysis shows is that up to 67% of earlier versions of Arista EOS were comprised of commands copied from Cisco and that, as Arista added more commands overtime, that percentage gradually decreased to 37.6%:

EOS Versions	Number of Copied Commands	Total Commands in EOS Manual	Total Command % Between Second And Third Columns
4.0.1	101/509	189	53.4%
4.4.0	167/509	308	54.2%
4.6.2	126/509	188	67.0%
4.10.0	353/509	674	52.4%
4.11.1.2	431/509	853	50.5%
4.11.2.1	445/509	890	50.0%
4.12.4	472/509	1084	43.5%
4.13.6F	508/509	1263	40.2%
4.13.7M	508/509	1281	39.7%
4.14.3F	508/509	1327	38.3%
4.14.5F	507/509	1341	37.8%
4.14.6M	507/509	1339	37.9%
4.15.0F	456/509	1368	33.3%
4.15.3F	508/509	1352	37.6%

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<sup>167</sup> Elsten at 19-20.

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[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED] And, as a result, it is reasonable to assume that Arista has included the most relevant command expressions in the user manuals so that its customer can utilize its products in a manner that Arista intended. Accordingly, analyzing the command expressions copied into Arista’s manuals captures a better picture of just how substantial Arista’s copying of Cisco’s command expressions has been over time.

**D. “The effect of the use upon the potential market for or value of the copyrighted work”**

156. I understand that the inquiry under the fourth fair use factor includes harm to the original and derivative works and the effect on the potential market if the challenged use becomes widespread.

157. In my opinion, Arista’s use of Cisco’s copyrighted works impacts actual and potential markets because, as I stated above and in my opening report, I understand that Arista directly competes with Cisco for sales of products (switches and routers) that incorporate and use Cisco’s copyrighted works. [REDACTED]

[REDACTED]



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engineer operating an Arista device would have a hard time knowing that he or she is not using a Cisco IOS product. That was apparent to me from the testing that I performed on both Cisco and Arista switches, as I set forth in my opening report. As a result, in my opinion Cisco is forced to compete with its own technology in the marketplace.

159. Further, as I stated in my opening report and above, I understand that Arista provides products, software, and technical support incorporating Cisco’s copyrights to its distributors and/or customers so that they use Arista’s EOS and its CLI.<sup>173</sup> Arista thus knows that its distributors and customers purchase its products to use, reproduce, distribute, and/or publicly display computer programs and/or other works that incorporate Cisco’s copyrights, including by use of Cisco’s IOS CLI—Arista has publicly admitted that at least 80% of its customers consider this infringing functionality to be an important factor in their decisions to purchase Arista’s products.<sup>174</sup> In my opinion, it is logical to conclude that Arista has knowledge that its acts contribute to and encourage its distributors’ and customers’ copying of Cisco’s copyrights as well in order to drive competition with Cisco.

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

161. In addition to the foregoing, I understand that this fair use factor considers what would happen to Cisco’s market if anyone were able to make the same use that Arista has made and such use became widespread. In light of the foregoing impacts from Arista’s use alone, it is

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<sup>173</sup> Almeroth Opening Report Para. 154.

<sup>174</sup> CSI-CLI-00540078 at CSI-CLI-00540079

<sup>175</sup> Almeroth Opening Report Paras. 149-151.

<sup>176</sup> Almeroth Opening Report Paras. 149-151.

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clear that widespread use of this nature would further impact Cisco’s ability to compete in the market—with more IOS clones in the marketplace, it becomes harder for Cisco to leverage the innovation and investment in its copyrighted works for itself. And as I stated above, I have yet to see any evidence of any widespread copying of Cisco’s copyrighted works that comes close to what Arista has done.

### **VIII. NETWORK ORCHESTRATION PRODUCTS & TAIL-F**

162. Arista’s expert also provided comments and opinions relating to certain network orchestration products and other products (*e.g.*, ConfD) that are not at issue in this case.

Although it is unclear why Arista’s experts have provided descriptions and analysis of these products, I have nevertheless analyzed those products, the relevant witness testimony, and Arista’s expert opinions regarding those products. I also have spoken with Cisco engineers regarding the marketing, operation, and functionality of the products. In sum, none of Arista’s expert opinions nor the evidence I have reviewed change my opinion that Arista has copied Cisco’s copyrighted works, and I have seen no suggestion from any Arista expert that their analysis of these products is at all relevant to the determination of what Arista copied Cisco.

■ [REDACTED]

[REDACTED]

■ [REDACTED]

[REDACTED]  
[REDACTED]  
[REDACTED]  
[REDACTED]  
[REDACTED]

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■ [REDACTED]

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[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

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[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

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[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

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[REDACTED]

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[REDACTED]

[REDACTED]

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[illegible][illegible]

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[REDACTED]

165. I also disagree with Arista’s experts’ discussion of the operation and functionality of the products. [REDACTED]

[REDACTED]

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[REDACTED]



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[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

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[REDACTED]

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the right to consider and testify about issues that may be raised by Arista’s fact witnesses and experts at trial. I also reserve the right to modify or to supplement my opinions as a result of ongoing expert discovery or testimony at trial.

I certify under penalty of perjury that the foregoing is true and correct.

By:   
Dr. Kevin C. Almeroth  
June 17, 2016

## Kevin C. Almeroth

Professor, Department of Computer Science  
University of California  
Santa Barbara, CA 93106-5110  
(805)636-1123 (office)  
(805)893-8553 (fax)  
almeroth@cs.ucsb.edu (email)  
<http://www.cs.ucsb.edu/~almeroth> (WWW URL)

### Education

- Ph.D.** June 1997 *Georgia Institute of Technology* Computer Science  
*Dissertation Title:* Networking and System Support for the Efficient,  
Scalable Delivery of Services in Interactive Multimedia Systems  
*Minor:* Telecommunications Public Policy
- M.S.** June 1994 *Georgia Institute of Technology* Computer Science  
*Specialization:* Networking and Systems
- B.S.** June 1992 *Georgia Institute of Technology* Information and Computer Science  
**(high honors)** *Minors:* Economics, Technical Communication, American Literature

### Employment History

Professor	Department of Computer Science University of California Santa Barbara, CA	Jul 2005 -- present
Associate Dean	College of Engineering University of California Santa Barbara, CA	Mar 2007 -- Aug 2009
Vice Chair	Department of Computer Science University of California Santa Barbara, CA	Jul 2000 -- Nov 2005
Associate Professor	Department of Computer Science University of California Santa Barbara, CA	Jul 2001 -- Jun 2005
Assistant Professor	Department of Computer Science University of California Santa Barbara, CA	Jul 1997 -- Jun 2001

Graduate Researcher	Broadband Telecommunications Center Georgia Center for Adv Telecom Tech Atlanta, GA	Sep 1996--Jun 1997
Graduate Intern	IBM T.J. Watson Research Labs Hawthorne, NY	Jun 1995--Sep 1995
Support Specialist	Office of Information Technology Georgia Institute of Technology Atlanta, GA	Sep 1995--Jun 1997
Research Assistant	College of Computing Georgia Institute of Technology Atlanta, GA	Jan 1994--Mar 1994
Graduate Intern	Hitachi Telecommunications Norcross, GA	Jun 1992--Sep 1992

## Industry Technical Advising

Board of Directors	<a href="#">The New Media Studio</a> Santa Barbara, CA	Nov 2006 -- present
Co-Founder & Chairman of the Board	Santa Barbara Labs, LLC Santa Barbara, CA	Sep 2007 -- Dec 2009
Board of Advisors	Techknowledge Point Santa Barbara, CA	May 2001 -- Dec 2007
Technical Advisory Board	Occam Networks, Inc. Santa Barbara, CA	May 2000 -- Dec 2010
Board of Advisors	Airplay Inc. San Francisco, CA	Jun 2005 -- Aug 2009
Consultant	Lockheed Martin Corporation San Jose, CA	Nov 1999 -- Jun 2009
Board of Advisors	Santa Barbara Technology Group Santa Barbara, CA	Sep 2000 -- Dec 2004
Board of Directors	Virtual Bandwidth, Inc. Santa Barbara, CA	Nov 2000 -- Jun 2001
Board of Advisors & Affiliated Scientist	Digital Fountain San Francisco, CA	Jan 2000 -- Dec 2001
Senior Technologist	IP Multicast Initiative, Stardust Forums Campbell, CA	Jun 1998 -- Dec 2000

## I. Teaching

**A. Courses Taught**

CS 176A	Intro to Computer Communication Networks	Fall 1997, Fall 1998, Fall 2002, Fall 2003, Fall 2004, Spring 2005, Spring 2006, Spring 2007, Spring 2008, Fall 2008, Fall 2009, Fall 2010, Fall 2011, Fall 2012, Fall 2013, Fall 2014
CS 176B	Network Computing	Winter 2000, Winter 2001, Winter 2002, Winter 2012, Winter 2014, Winter 2015
MAT 201B	Media Networks and Services	Fall 1999, Fall 2000, Fall 2001, Fall 2003
CS 276	Distributed Computing and Computer Networks	Winter 1999, Spring 2000, Fall 2002, Fall 2005
CS 290I	Networking for Multimedia Systems	Winter 1998, Spring 1999, Fall 2004, Winter 2010
CS 595N	Technology and Society	Winter 2005, Fall 2005, Spring 2006, Fall 2006, Spring 2007, Fall 2007, Spring 2008, Fall 2008, Spring 2009
CS 595N	Economic Systems Seminar	Winter 2004, Spring 2004, Winter 2005, Spring 2005
CS 595N	Networking Seminar	Winter 1999, Fall 1999, Winter 2003
CS 595N	Wireless Networking & Multimedia Seminar	Fall 2000
CS 595I	Systems Design and Implementation Seminar	Fall 1999, Fall 2000, Winter 2001, Spring 2001, Winter 2002, Spring 2002

**B. Other Teaching Experience**

- *The Evolution of Advanced Networking Services: From the ARPAnet to Internet2*, Instructor, Summer 2001. Short course taught at Escuela de Ciencias Informatica (ECI) sponsored by the Universidad de Buenos Aires.
- *Johns Hopkins Center for Talented Youth*, Instructor, Summer 1994. CTY is a program to teach gifted high school students the fundamentals of computer science.
- *Georgia Institute of Technology*, Graduate Teaching Assistant, Sep 1994--Sep 1996. Worked as a TA for 12 quarters teaching 7 different courses (4 undergraduate and 3 graduate).

**C. Ph.D. Students Advised [14 graduated]**

14. Daniel Havey  
Research Area: *Throughput and Delay on the Packet Switched Internet*  
Date Graduated: Winter 2015  
First Position: Microsoft
13. Lara Deek (co-advised with E. Belding)  
Research Area: *Resource-Efficient Wireless Systems for Emerging Wireless Networks*  
Date Graduated: Summer 2014  
First Position: Post Doc, UIUC
12. Mike Wittie

Research Area: *Towards Sustained Scalability of Communication Networks*

Date Graduated: Summer 2011

First Position: Assistant Professor, Montana State University

11. Allan Knight

Research Area: *Supporting Integration of Educational Technologies and Research of Their Effects on Learning*

Date Graduated: Summer 2009

First Position: Research Scientist, Citrix Online

10. Hangjin Zhang

Research Area: *Towards Blended Learning: Educational Technology to Improve and Assess Teaching and Learning*

Date Graduated: Spring 2009

First Position: Microsoft

9. Gayatri Swamynathan

Dissertation Title: *Towards Reliable Reputations for Distributed Applications*

Date Graduated: Spring 2008

First Position: Zynga

8. Amit Jardosh (co-advised with E. Belding)

Dissertation Title: *Adaptive Large-Scale Wireless Networks: Measurements, Protocol Designs, and Simulation Studies*

Date Graduated: Fall 2007

First Position: Yahoo!

7. Khaled Harras

Dissertation Title: *Protocol and Architectural Challenges in Delay and Disruption Tolerant Networks*

Date Graduated: Summer 2007

First Position: Assistant Professor, Carnegie Mellon University

6. Krishna Ramachandran (co-advised with E. Belding)

Dissertation Title: *Design, Deployment, and Management of High-Capacity Wireless Mesh Networks*

Date Graduated: Winter 2006

First Position: Research Scientist, Citrix Online

5. Robert Chalmers

Dissertation Title: *Improving Device Mobility with Intelligence at the Network Edge*

Date Graduated: Summer 2004

First Position: President and CEO, Limbo.net

4. Prashant Rajvaidya

Dissertation Title: *Achieving Robust and Secure Deployment of Multicast*

Date Graduated: Spring 2004

First Position: President and CTO, Mosaic Networking

3. Sami Rollins

Dissertation Title: *Overcoming Resource Constraints to Enable Content Exchange Applications in Next-Generation Environments*

Date Graduated: Spring 2003

First Position: Assistant Professor, Mount Holyoke College

2. Srinivasan Jagannathan

Dissertation Title: *Multicast Tree-Based Congestion Control and Topology Management*

Date Graduated: Spring 2003

First Position: Consultant, Kelly & Associates

1. Kamil Sarac

Dissertation Title: *Supporting a Robust Multicast Service in the Global Infrastructure*

Date Graduated: Spring 2002

First Position: Assistant Professor, UT-Dallas

**D. M.S. Students Advised (Thesis/Project Option) [19 graduated and 1 current]**

20. Greg Parsons  
Research Area: *Drone-Based Mesh Networks*  
Date Started: Fall 2014
19. Neer Shey  
Research Area: *Analyzing Content Distribution Through Opportunistic Contact for Smart Cellular Phones*  
Date Graduated: Spring 2010
18. Camilla Fiorese  
Research Area: *Analysis of a Pure Rate-Based Congestion Control Algorithm*  
Date Graduated: Summer 2009
17. Brian Weiner  
Research Area: *Multi-Socket TCP: A Simple Approach to Improve Performance of Real-Time Applications over TCP*  
Date Graduated: Fall 2007
16. Avijit Sen Mazumder  
Research Area: *Facilitating Robust Multicast Group Management*  
Date Graduated: Fall 2005
15. Rishi Matthew  
Thesis Title: *Providing Seamless Access to Multimedia Content on Heterogeneous Platforms*  
Date Graduated: Summer 2004
14. Camden Ho  
Research Area: *Tools and Techniques for Wireless Network Management*  
Date Graduated: Spring 2004
13. Amit Jardosh (co-advised with E. Belding)  
Research Area: *Realistic Environment Models for Mobile Network Evaluation*  
Date Graduated: Spring 2004
12. Nitin Solanki  
Research Area: *SongWand: A Wireless Barcode Scanner Using Bluetooth Technology*  
Date Graduated: Winter 2004
11. Vrishali Wagle (co-advised with E. Belding)  
Research Area: *An Ontology-Based Service Discovery Mechanism*  
Date Graduated: Winter 2004
10. Uday Mohan  
Thesis Title: *Scalable Service Discovery in Mobile Ad hoc Networks*  
Date Graduated: Spring 2003
9. Krishna Ramachandran  
Thesis Title: *Ubiquitous Multicast*  
Date Graduated: Spring 2003
8. John Slonaker  
Thesis Title: *Inductive Loop Signature Acquisition Techniques*  
Date Graduated: Spring 2002
7. Mohammad Battah  
Thesis Title: *Dedicated Short-Range Communications Intelligent Transportation Systems Protocol (DSRC-ITS)*  
Date Graduated: Spring 2002
6. Kevin Vogel  
Thesis Title: *Integrating E-Commerce Applications into Existing Business Infrastructures*  
Date Graduated: Spring 2001
5. Sami Rollins  
Thesis Title: *Audio Xml: Aural Interaction with XML Documents*  
Date Graduated: Winter 2000
4. Andy Davis

Thesis Title: *Stream Scheduling for Data Servers in a Scalable Interactive TV System*

Date Graduated: Spring 1999

3. David Makofske

Thesis Title: *MHealth: A Real-Time Graphical Multicast Monitoring Tool*

Date Graduated: Winter 1999

2. Prashant Rajvaidya

Thesis Title: *MANTRA: Router-Based Monitoring and Analysis of Multicast Traffic*

Date Graduated: Winter 1999

1. Alex DeCastro (co-advised with Yuan-Fang Wang)

Thesis Title: *Web-Based Collaborative 3D Modeling*

Date Graduated: Winter 1998

## E. Teaching Awards

2006-2007 UCSB Academic Senate Distinguished Teaching Award

2004-2005 Computer Science Outstanding Faculty Member

2000-2001 UCSB Spotlight on Excellence Award

1999-2000 Computer Science Outstanding Faculty Member (co-recipient)

1998-1999 Computer Science Outstanding Faculty Member (co-recipient)

1997-1998 Computer Science Outstanding Faculty Member

## II. Research

### A. Journal Papers, Magazine Articles, Books, and Book Chapters

62. L. Deek, E. Garcia-Villegas, E. Belding, S.J. Lee, and K. Almeroth, "[A Practical Framework for 802.11 MIMO Rate Adaptation](#)," *Computer Networks*, vol. 83, num. 6, pp. 332-348, June 2015.
61. L. Deek, E. Garcia-Villegas, E. Belding, S.J. Lee, and K. Almeroth, "[Intelligent Channel Bonding in 802.11n WLANs](#)," *IEEE Transactions on Mobile Computing*, vol. 13, num. 6, pp. 1242-1255, June 2014.
60. H. Zhang and K. Almeroth, "[Alternatives for Monitoring and Limiting Network Access to Students in Network-Connected Classrooms](#)," *Journal of Interactive Learning Research (JILR)*, vol. 24, num. 3, pp. 237-265, July 2013.
59. M. Tavakolifard and K. Almeroth, "[A Taxonomy to Express Open Challenges in Trust and Reputation Systems](#)," *Journal of Communications*, vol. 7, num. 7, pp. 538-551, July 2012.
58. M. Tavakolifard and K. Almeroth, "[Social Computing: An Intersection of Recommender Systems, Trust/Reputation Systems, and Social Networks](#)," *IEEE Network*, vol. 26, num. 4, pp. 53-58, July/August 2012.
57. M. Tavakolifard, K. Almeroth, and P. Ozturk, "[Subjectivity Handling of Ratings for Trust and Reputation Systems: An Abductive Reasoning Approach](#)," *International Journal of Digital Content Technology and its Applications (JDCTA)*, vol. 5, num. 11, pp. 359-377, November 2011.
56. R. Raghavendra, P. Acharya, E. Belding and K. Almeroth, "[MeshMon: A Multi-Tiered Framework for Wireless Mesh Network Monitoring](#)," *Wireless Communications and Mobile Computing (WCMC) Journal*, vol. 11, num. 8, pp. 1182-1196, August 2011.

55. A. Knight and K. Almeroth, "[Automatic Plagiarism Detection with PAIRwise 2.0](#)," Journal of Interactive Learning Research (JILR), vol. 22, num. 3, pp. 379-400, July 2011.
54. V. Kone, M. Zheleva, M. Wittie, B. Zhao, E. Belding, H. Zheng, and K. Almeroth, "[AirLab: Consistency, Fidelity and Privacy in Wireless Measurements](#)," ACM Computer Communications Review, vol. 41, num. 1, pp. 60-65, January 2011.
53. G. Swamynathan, K. Almeroth, and B. Zhao, "[The Design of a Reliable Reputation System](#)," Electronic Commerce Research Journal, vol. 10, num. 3-4, pp. 239-270, December 2010.
52. P. Acharya, A. Sharma, E. Belding, K. Almeroth and K. Papagiannaki, "[Rate Adaptation in Congested Wireless Networks through Real-Time Measurements](#)," IEEE Transactions on Mobile Computing, vol. 9, num. 11, pp. 1535-1550, November 2010.
51. R. Raghavendra, E. Belding, K. Papagiannaki, and K. Almeroth, "[Unwanted Link Layer Traffic in Large IEEE 802.11 Wireless Networks](#)," IEEE Transactions on Mobile Computing, vol. 9, num. 9, pp. 1212-1225, September 2010.
50. H. Zhang and K. Almeroth, "[Moodog: Tracking Student Activity in Online Course Management Systems](#)," Journal of Interactive Learning Research (JILR), vol. 21, num. 3, pp. 407-429, July 2010.
49. R. Chertov and K. Almeroth, "[Qualitative Comparison of Link Shaping Techniques](#)," International Journal of Communication Networks and Distributed Systems, vol. 5, num. 1/2, pp. 109-129, July 2010.
48. A. Knight and K. Almeroth, "[Fast Caption Alignment for Automatic Indexing of Audio](#)," International Journal of Multimedia Data Engineering and Management, vol. 1, num. 2, pp. 1-17, April-June 2010.
47. K. Harras and K. Almeroth, "[Scheduling Messengers in Disconnected Clustered Mobile Networks](#)," Ad Hoc & Sensor Wireless Networks, vol. 9, num. 3-4, pp. 275-304, March-April 2010.
46. A. Jardosh, K. Papagiannaki, E. Belding, K. Almeroth, G. Iannaccone, and B. Vinnakota, "[Green WLANs: On-Demand WLAN Infrastructures](#)," ACM Journal on Mobile Networks and Applications (MONET), vol. 14, num. 6, pp. 798-814, December 2009.
45. M. Wittie, K. Harras, K. Almeroth, and E. Belding, "[On the Implications of Routing Metric Staleness in Delay Tolerant Networks](#)," Computer Communications Special Issue on Delay and Disruption Tolerant Networking, vol. 32, num. 16, pp. 1699-1709, October 2009.
44. K. Harras, L. Deek, C. Holman, and K. Almeroth, "[DBS-IC: An Adaptive Data Bundling System for Intermittent Connectivity](#)," Computer Communications Special Issue on Delay and Disruption Tolerant Networking, vol. 32, num. 16, pp. 1687-1698, October 2009.
43. S. Karpinski, E. Belding, K. Almeroth, and J. Gilbert, "[Linear Representations of Network Traffic](#)," ACM Journal on Mobile Networks and Applications (MONET), vol. 14, num. 4, pp. 368-386, August 2009.
42. K. Harras and K. Almeroth, "[Controlled Flooding in Disconnected Sparse Mobile Networks](#)," Wireless Communications and Mobile Computing (WCMC) Journal, vol. 9, num. 1, pp. 21-33, January 2009.
41. R. Mayer, A. Stull, K. DeLeeuw, K. Almeroth, B. Bimber, D. Chun, M. Bulger, J. Campbell, A. Knight, and H. Zhang, "[Clickers in College Classrooms: Fostering Learning with Questioning Methods in Large Lecture Classes](#)," Contemporary Educational Psychology, vol. 34, num. 1, pp. 51-57, January 2009.
40. A. Knight, K. Almeroth, and B. Bimber, "[Design, Implementation and Deployment of PAIRwise](#)," Journal of Interactive Learning Research (JILR), vol. 19, num. 3, pp. 489-508, July 2008.
39. A. Garyfalos and K. Almeroth, "[Coupons: A Multilevel Incentive Scheme for Information Dissemination in Mobile](#)

[Networks](#)," *IEEE Transactions on Mobile Computing*, vol. 7, num. 6, pp. 792-804, June 2008.

38. I. Sheriff, K. Ramachandran, E. Belding, and K. Almeroth, "[A Multi-Radio 802.11 Mesh Network Architecture](#)," *ACM Journal on Mobile Networks and Applications (MONET)*, vol. 13, num. 1-2, pp. 132-146, April 2008.
37. M. Bulger, R. Mayer, K. Almeroth, and S. Blau, "[Measuring Learner Engagement in Computer-Equipped College Classrooms](#)," *Journal of Educational Multimedia and Hypermedia*, vol. 17, num. 2, pp. 129-143, April 2008.
36. G. Swamynathan, B. Zhao, and K. Almeroth, "[Exploring the Feasibility of Proactive Reputations](#)," *Concurrency and Computation: Practice and Experience*, vol. 20, num. 2, pp. 155-166, February 2008.
35. G. Swamynathan, B. Zhao, K. Almeroth, and H. Zheng, "[Globally Decoupled Reputations for Large Distributed Networks](#)," *Advances in Multimedia*, vol. 2007, pp. 1-14, 2007.
34. R. Mayer, A. Stull, J. Campbell, K. Almeroth, B. Bimber, D. Chun and A. Knight, "[Overestimation Bias in Self-reported SAT Scores](#)," *Educational Psychology Review*, vol. 19, num. 4, pp. 443-454, December 2007.
33. P. Namburi, K. Sarac and K. Almeroth, "[Practical Utilities for Monitoring Multicast Service Availability](#)," *Computer Communications Special Issue on Monitoring and Measurement of IP Networks*, vol. 29, num. 10, pp. 1675-1686, June 2006.
32. R. Chalmers, G. Krishnamurthi and K. Almeroth, "[Enabling Intelligent Handovers in Heterogeneous Wireless Networks](#)," *ACM Journal on Mobile Networks and Applications (MONET)*, vol. 11, num. 2, pp. 215-227, April 2006.
31. H. Lundgren, K. Ramachandran, E. Belding, K. Almeroth, M. Benny, A. Hewatt, A. Touma and A. Jardosh, "[Experience from the Design, Deployment and Usage of the UCSB MeshNet Testbed](#)," *IEEE Wireless Communications*, vol. 13, num. 2, pp. 18-29, April 2006.
30. R. Mayer, K. Almeroth, B. Bimber, D. Chun, A. Knight and A. Campbell, "[Technology Comes to College: Understanding the Cognitive Consequences of Infusing Technology in College Classrooms](#)," *Educational Technology*, vol. 46, num. 2, pp. 48-53, March-April 2006.
29. A. Garyfalos and K. Almeroth, "[A Flexible Overlay Architecture for Mobile IPv6 Multicast](#)," *Journal on Selected Areas in Communications (JSAC) Special Issue on Wireless Overlay Networks Based on Mobile IPv6*, vol. 23, num. 11, pp. 2194-2205, November 2005.
28. K. Sarac and K. Almeroth, "[Monitoring IP Multicast in the Internet: Recent Advances and Ongoing Challenges](#)," *IEEE Communications*, vol. 43, num. 10, pp. 85-91, October 2005.
27. K. Sarac and K. Almeroth, "[Application Layer Reachability Monitoring for IP Multicast](#)," *Computer Networks*, vol. 48, num. 2, pp. 195-213, June 2005.
26. A. Jardosh, E. Belding, K. Almeroth and S. Suri, "[Real-world Environment Models for Mobile Network Evaluation](#)," *Journal on Selected Areas in Communications Special Issue on Wireless Ad hoc Networks*, vol. 23, num. 3, pp. 622-632, March 2005.
25. S. Rollins and K. Almeroth, "[Evaluating Performance Tradeoffs in a One-to-Many Peer Content Distribution Architecture](#)," *Journal of Internet Technology*, vol. 5, num. 4, pp. 373-387, Fall 2004.
24. K. Sarac and K. Almeroth, "[Tracetree: A Scalable Mechanism to Discover Multicast Tree Topologies in the Network](#)," *IEEE/ACM Transactions on Networking*, vol. 12, num. 5, pp. 795-808, October 2004.
23. K. Sarac and K. Almeroth, "[A Distributed Approach for Monitoring Multicast Service Availability](#)," *Journal of Network and Systems Management*, vol. 12, num. 3, pp. 327-348, September 2004.

22. P. Rajvaidya, K. Ramachandran and K. Almeroth, "[Managing and Securing the Global Multicast Infrastructure](#)," *Journal of Network and Systems Management*, vol. 12, num. 3, pp. 297-326, September 2004.
21. P. Rajvaidya and K. Almeroth, "[Multicast Routing Instabilities](#)," *IEEE Internet Computing*, vol. 8, num. 5, pp. 42-49, September/October 2004.
20. D. Johnson, R. Patton, B. Bimber, K. Almeroth and G. Michaels, "[Technology and Plagiarism in the University: Brief Report of a Trial in Detecting Cheating](#)," *Association for the Advancement of Computing in Education (AACE) Journal*, vol. 12, num. 3, pp. 281-299, Summer 2004.
19. R. Chalmers and K. Almeroth, "[A Security Architecture for Mobility-Related Services](#)," *Journal of Wireless Personal Communications*, vol 29, num. 3, pp. 247-261, June 2004.
18. B. Stiller, K. Almeroth, J. Altmann, L. McKnight, and M. Ott, "[Pricing for Content in the Internet](#)," *Computer Communications*, vol. 27, num. 6, pp. 522-528, April 2004.
17. S. Rollins and K. Almeroth, "[Lessons Learned Deploying a Digital Classroom](#)," *Journal of Interactive Learning Research (JILR)*, vol. 15, num. 2, pp. 169-185, April 2004.
16. S. Jagannathan and K. Almeroth, "[A Dynamic Pricing Scheme for E-Content at Multiple Levels-of-Service](#)," *Computer Communications*, vol. 27, num. 4, pp. 374-385, March 2004.
15. K. Almeroth, "[Using Satellite Links in the Delivery of Terrestrial Multicast Traffic](#)," *Internetworking and Computing over Satellites*, Kluwer Academic Publishers, 2003.
14. R. Chalmers and K. Almeroth, "[On the Topology of Multicast Trees](#)," *IEEE/ACM Transactions on Networking*, vol. 11, num. 1, pp. 153-165, January 2003.
13. S. Jagannathan, J. Nayak, K. Almeroth, and M. Hofmann, "[On Pricing Algorithms for Batched Content Delivery Systems](#)," *Electronic Commerce Research and Applications Journal*, vol. 1, num. 3-4, pp. 264-280, Fall 2002.
12. D. Makofske and K. Almeroth, "[Multicast Sockets: Practical Guide for Programmers](#)," *Morgan Kaufmann Publishers*, November 2002.
11. S. Jagannathan and K. Almeroth, "[Price Issues in Delivering E-Content On-Demand](#)," *ACM Sigecom Exchanges*, vol. 3, num. 2, pp. 18-27, May 2002.
10. D. Makofske and K. Almeroth, "[From Television to Internet Video-on-Demand: Techniques and Tools for VCR-Style Interactivity](#)," *Software: Practice and Experience*, vol. 31, num. 8, pp. 781-801, July 2001.
9. K. Sarac and K. Almeroth, "[Supporting Multicast Deployment Efforts: A Survey of Tools for Multicast Monitoring](#)," *Journal on High Speed Networking*, Special Issue on Management of Multimedia Networking, vol. 9, num. 3/4, pp. 191-211, March 2001.
8. K. Almeroth, "[Adaptive, Workload-Dependent Scheduling for Large-Scale Content Delivery Systems](#)," *Transactions on Circuits and Systems for Video Technology, Special Issue on Streaming Video*, vol. 11, num. 3, pp. 426-439, March 2001.
7. D. Makofske and K. Almeroth, "[Real-Time Multicast Tree Visualization and Monitoring](#)," *Software: Practice and Experience*, vol. 30, num. 9, pp. 1047-1065, July 2000.
6. M. Ammar, K. Almeroth, R. Clark and Z. Fei, "Multicast Delivery of WWW Pages," *Electronic Commerce Technology Trends: Challenges and Opportunities*, IBM Press, February 2000.
5. K. Almeroth, "[The Evolution of Multicast: From the MBone to Inter-Domain Multicast to Internet2 Deployment](#)," *IEEE Network Special Issue on Multicasting*, vol. 10, num. 1, pp. 10-20, January/February 2000.

4. K. Almeroth and M. Ammar, "[An Alternative Paradigm for Scalable On-Demand Applications: Evaluating and Deploying the Interactive Multimedia Jukebox](#)," *IEEE Transactions on Knowledge and Data Engineering Special Issue on Web Technologies*, vol. 11, num. 4, pp 658-672, July/August 1999.
3. K. Almeroth and M. Ammar, "[The Interactive Multimedia Jukebox \(IMJ\): A New Paradigm for the On-Demand Delivery of Audio/Video](#)," *Computer Networks and ISDN Systems*, vol. 30, no. 1, April 1998.
2. K. Almeroth and M. Ammar, "[Multicast Group Behavior in the Internet's Multicast Backbone \(MBone\)](#)," *IEEE Communications*, vol. 35, no. 6, pp. 124-129, June 1997.
1. K. Almeroth and M. Ammar, "[On the Use of Multicast Delivery to Provide a Scalable and Interactive Video-on-Demand Service](#)," *Journal on Selected Areas of Communication (JSAC)*, vol. 14, no. 6, pp. 1110-1122, August 1996.

## B. Conference Papers with Proceedings (refereed)

89. D. Havey and K. Almeroth, "[Active Sense Queue Management \(ASQM\)](#)," *IFIP Networking Conference*, Toulouse, FRANCE, May 2015.
88. L. Deek, E. Garcia-Villegas, E. Belding, S.J. Lee, and K. Almeroth, "[Joint Rate and Channel Width Adaptation in 802.11 MIMO Wireless Networks](#)," *IEEE Conference on Sensor, Mesh and Ad Hoc Communications and Networks (SECON)*, New Orleans, LA, USA, June 2013.
87. D. Havey and K. Almeroth, "[Fast Wireless Protocol: A Network Stack Design for Wireless Transmission](#)," *IFIP Networking Conference*, Brooklyn, New York, USA, May 2013.
86. M. Tavakolifard, J. Gulla, K. Almeroth, J. Ingvaldsen, G. Nygreen, and E. Berg, "[Tailored News in the Palm of Your HAND: A Multi-Perspective Transparent Approach to News Recommendation](#)," *Demo Track at the International World Wide Web Conference (WWW)*, Rio de Janeiro, BRAZIL, May 2013.
85. S. Patterson, M. Wittie, K. Almeroth, and B. Bamieh, "[Network Optimization with Dynamic Demands and Link Prices](#)," *Allerton Conference*, Monticello, Illinois, USA, October 2012.
84. D. Havey, R. Chertov, and K. Almeroth, "[Receiver Driven Rate Adaptation](#)," *ACM Multimedia Systems Conference (MMSys)*, Chapel Hill, North Carolina, USA, February 2012.
83. M. Tavakolifard and K. Almeroth, "[Trust 2.0: Who to Believe in the Flood of Online Data?](#)" *International Conference on Computing, Networking and Communications (ICNC)*, Maui, Hawaii, USA, January 2012.
82. L. Deek, E. Garcia-Villegas, E. Belding, S.J. Lee, and K. Almeroth, "[The Impact of Channel Bonding on 802.11n Network Management](#)," *ACM CoNEXT*, Tokyo, JAPAN, December 2011.
81. L. Deek, X. Zhou, K. Almeroth, and H. Zheng, "[To Preempt or Not: Tackling Bid and Time-based Cheating in Online Spectrum Auctions](#)," *IEEE Infocom*, Shanghai, CHINA, April 2011.
80. M. Wittie, V. Pejovic, L. Deek, K. Almeroth, and B. Zhao, "[Exploiting Locality of Interest in Online Social Networks](#)," *ACM CoNEXT*, Philadelphia, Pennsylvania, USA, November 2010.
79. R. Chertov and K. Almeroth, "[Using BGP in a Satellite-Based Challenged Network Environment](#)," *IEEE Conference on Sensor, Mesh and Ad Hoc Communications and Networks (SECON)*, Boston, Massachusetts, USA, June 2010.
78. R. Chertov, D. Havey and K. Almeroth, "[MSET: A Mobility Satellite Emulation Testbed](#)," *IEEE Infocom*, San Diego, California, USA, March 2010.

77. B. Stone-Gross, A. Moser, C. Kruegel, E. Kirda, and K. Almeroth, "[FIRE: Finding Rogue nEtworks](#)," *Annual Computer Security Applications Conference (ACSAC)*, Honolulu, Hawaii, USA, December 2009.
76. M. Wittie, K. Almeroth, E. Belding, I. Rimal, and V. Hilt, "[Internet Service in Developing Regions Through Network Coding](#)," *IEEE Conference on Sensor, Mesh and Ad Hoc Communications and Networks (SECON)*, Rome, ITALY, June 2009.
75. R. Chertov and K. Almeroth, "[High-Fidelity Link Shaping](#)," *International Conference on Testbeds and Research Infrastructures for the Development of Networks and Communities (TRIDENTCOM)*, Washington DC, USA, April 2009.
74. L. Deek, K. Almeroth, M. Wittie, and K. Harras, "[Exploiting Parallel Networks Using Dynamic Channel Scheduling](#)," *International Wireless Internet Conference (WICON)*, Maui, Hawaii, USA, November 2008.
73. D. Havey, E. Barlas, R. Chertov, K. Almeroth, and E. Belding, "[A Satellite Mobility Model for QUALNET Network Simulations](#)," *IEEE Military Communications Conference (MILCOM)*, San Diego, California, USA, November 2008.
72. J. Kayfetz and K. Almeroth, "[Creating Innovative Writing Instruction for Computer Science Graduate Students](#)," *ASEE/IEEE Frontiers in Education (FIE) Conference*, Saratoga Springs, New York, USA, October 2008.
71. G. Swamynathan, B. Zhao, K. Almeroth, and S. Rao, "[Towards Reliable Reputations for Dynamic Networked Systems](#)," *IEEE International Symposium on Reliable Distributed Systems (SRDS)*, Napoli, ITALY, October 2008.
70. B. Stone-Gross, D. Sigal, R. Cohn, J. Morse, K. Almeroth, and C. Krugel, "[VeriKey: A Dynamic Certificate Verification System for Public Key Exchanges](#)," *Conference on Detection of Intrusions and Malware & Vulnerability Assessment (DIMVA)*, Paris, FRANCE, July 2008.
69. P. Acharya, A. Sharma, E. Belding, K. Almeroth, K. Papagiannaki, "[Congestion-Aware Rate Adaptation in Wireless Networks: A Measurement-Driven Approach](#)," *IEEE Conference on Sensor, Mesh and Ad Hoc Communications and Networks (SECON)*, San Francisco, California, USA, June 2008.
68. A. Jardosh, P. Suwannat, T. Hollerer, E. Belding, and K. Almeroth, "[SCUBA: Focus and Context for Real-time Mesh Network Health Diagnosis](#)," *Passive and Active Measurement Conference (PAM)*, Cleveland, Ohio, USA, April 2008.
67. B. Stone-Gross, C. Wilson, K. Almeroth, E. Belding, H. Zheng, K. Papagiannaki, "[Malware in IEEE 802.11 Wireless Networks](#)," *Passive and Active Measurement Conference (PAM)*, Cleveland, Ohio, USA, April 2008.
66. R. Raghavendra, E. Belding, K. Papagiannaki, and K. Almeroth, "[Understanding Handoffs in Large IEEE 802.11 Wireless Networks](#)," *Internet Measurement Conference (IMC)*, San Diego, California, USA, October 2007.
65. M. Wittie, B. Stone-Gross, K. Almeroth and E. Belding, "[MIST: Cellular Data Network Measurement for Mobile Applications](#)," *IEEE International Conference on Broadband Communications, Networks, and Systems (BroadNets)*, Raleigh, North Carolina, USA, September 2007.
64. S. Karpinski, E. Belding, K. Almeroth, "[Wireless Traffic: The Failure of CBR Modeling](#)," *IEEE International Conference on Broadband Communications, Networks, and Systems (BroadNets)*, Raleigh, North Carolina, USA, September 2007.
63. A. Knight, K. Almeroth, H. Zhang, R. Mayer, and K. DeLeeuw, "[Data Cafe: A Dining Car Approach to Educational Research Data Management and Distribution](#)," *World Conference on Educational Multimedia, Hypermedia & Telecommunications (ED MEDIA)*, Vancouver, CANADA, June 2007.
62. H. Zhang, K. Almeroth, A. Knight, M. Bulger, and R. Mayer, "[Moodog: Tracking Students' Online Learning Activities](#)," *World Conference on Educational Multimedia, Hypermedia & Telecommunications (ED MEDIA)*,

Vancouver, CANADA, June 2007.

61. M. Bulger, K. Almeroth, R. Mayer, D. Chun, A. Knight, H. Collins, "[Effects of Instructor Engagement on Student Use of a Course Management System](#)," Association for Psychological Science (APS) Annual Conference, Washington DC, USA, May 2007.
60. R. Mayer, A. Stull, K. Almeroth, B. Bimber, D. Chun, M. Bulger, J. Campbell, Allan Knight, and H. Zhang, "[Using Technology-Based Methods to Foster Learning in Large Lecture Classes: Evidence for the Pedagogic Value of Clickers](#)," *American Educational Research Association (AERA) Annual Conference*, Chicago, Illinois, USA, April 2007.
59. K. Ramachandran, I. Sheriff, E. Belding, and K. Almeroth, "[Routing Stability in Static Wireless Mesh Networks](#)," *Passive and Active Measurement Conference (PAM)*, Louvain-la-neuve, BELGIUM, April 2007.
58. G. Swamynathan, T. Close, S. Banerjee, R. McGeer, B. Zhao, and K. Almeroth, "[Scalable Access Control For Web Services](#)," *International Conference on Creating, Connecting and Collaborating through Computing (C5)*, Kyoto, JAPAN, January 2007.
57. A. Knight, M. Bulger, K. Almeroth, and H. Zhang, "[Is Learning Really a Phone Call Away? Knowledge Transfer in Mobile Learning](#)," *World Conference on Mobile Learning (mLearn)*, Banff, Alberta, CANADA, October 2006.
56. J. Kurian, K. Sarac, and K. Almeroth, "[Defending Network-Based Services Against Denial of Service Attacks](#)," *International Conference on Computer Communication and Networks (IC3N)*, Arlington, Virginia, USA, October 2006.
55. A. Jardosh, K. Sanzgiri, E. Belding and K. Almeroth, "[IQU: Practical Queue-Based User Association Management for WLANs--Case Studies, Architecture, and Implementation](#)," *ACM Mobicom*, Marina del Rey, California, USA, September 2006.
54. C. Holman, K. Harras, and K. Almeroth, "[A Proactive Data Bundling System for Intermittent Mobile Connections](#)," *IEEE International Conference on Sensor and Ad Hoc Communications and Networks (SECON)*, Reston, Virginia, USA, September 2006.
53. G. Banks, M. Cova, V. Felmetsger, K. Almeroth, R. Kemmerer and G. Vigna, "[SNOOZE: toward a Stateful NetwOrk prOtolocol fuzZE](#)," *Information Security Conference (ISC)*, Samos Island, GREECE, September 2006.
52. K. Harras and K. Almeroth, "[Inter-Regional Messenger Scheduling in Delay Tolerant Mobile Networks](#)," *IEEE International Symposium on a World of Wireless, Mobile and Multimedia Networks (WoWMoM)*, Niagara Falls, New York, USA, June 2006.
51. M. Bulger, R. Mayer, and K. Almeroth, "[Engaged By Design: Using Simulation to Promote Active Learning](#)," **Outstanding Paper** at the *World Conference on Educational Multimedia, Hypermedia & Telecommunications (ED MEDIA)*, Orlando, Florida, USA, June 2006.
50. A. Knight, K. Almeroth, R. Mayer, D. Chun, and B. Bimber, "[Observations and Recommendations for Using Technology to Extend Interaction](#)," *World Conference on Educational Multimedia, Hypermedia & Telecommunications (ED MEDIA)*, Orlando, Florida, USA, June 2006.
49. H. Zhang, and K. Almeroth, "[A Simple Classroom Network Access Control System](#)," *World Conference on Educational Multimedia, Hypermedia & Telecommunications (ED MEDIA)*, Orlando, Florida, USA, June 2006.
48. K. Harras and K. Almeroth, "[Transport Layer Issues in Delay Tolerant Mobile Networks](#)," *IFIP Networking Conference*, Coimbra, PORTUGAL, May 2006.
47. R. Mayer, A. Stull, J. Campbell, K. Almeroth, B. Bimber, D. Chun and A. Knight, "[Some Shortcomings of Soliciting Students' Self-Reported SAT Scores](#)," *American Educational Research Association (AERA) Annual*

Conference, San Francisco, California, USA, April 2006.

46. K. Ramachandran, E. Belding, K. Almeroth, and M. Buddhikot, "[Interference-Aware Channel Assignment in Multi-Radio Wireless Mesh Networks](#)," *IEEE Infocom*, Barcelona, SPAIN, April 2006.
45. A. Jardosh, K. Ramachandran, K. Almeroth, and E. Belding, "[Understanding Congestion in IEEE 802.11b Wireless Networks](#)," *ACM/USENIX Internet Measurement Conference (IMC)*, Berkeley, California, USA, October 2005.
44. H. Zhang, K. Almeroth and M. Bulger, "[An Activity Monitoring System to Support Classroom Research](#)," *World Conference on Educational Multimedia, Hypermedia & Telecommunications (ED MEDIA)*, Montreal, Quebec, CANADA, pp. 1444-1449, June 2005.
43. Z. Xiang, H. Zhang, J. Huang, S. Song and K. Almeroth, "[A Hidden Environment Model for Constructing Indoor Radio Maps](#)," *IEEE International Symposium on a World of Wireless, Mobile and Multimedia Networks (WoWMoM)*, Taormina, ITALY, June 2005.
42. K. Harras, K. Almeroth and E. Belding, "[Delay Tolerant Mobile Networks \(DTMNs\): Controlled Flooding in Sparse Mobile Networks](#)," *IFIP Networking Conference*, Waterloo, Ontario, CANADA, May 2005.
41. A. Garyfalos and K. Almeroth, "[Coupons: Wide Scale Information Distribution for Wireless Ad Hoc Networks](#)," *IEEE Global Telecommunications Conference (Globecom) Global Internet and Next Generation Networks Symposium*, Dallas, Texas, USA, pp. 1655-1659, December 2004.
40. A. Knight and K. Almeroth, "[DeCAF: A Digital Classroom Application Framework](#)," *IASTED International Conference on Communications, Internet and Information Technology (CIIT)*, St. Thomas, US Virgin Islands, November 2004.
39. P. Namburi, K. Sarac and K. Almeroth, "[SSM-Ping: A Ping Utility for Source Specific Multicast](#)," *IASTED International Conference on Communications, Internet and Information Technology (CIIT)*, St. Thomas, US Virgin Islands, November 2004.
38. K. Ramachandran, E. Belding and K. Almeroth, "[DAMON: A Distributed Architecture for Monitoring Multi-hop Mobile Networks](#)," *IEEE International Conference on Sensor and Ad Hoc Communications and Networks (SECON)*, Santa Clara, California, USA, October 2004.
37. A. Garyfalos and K. Almeroth, "[Coupon Based Incentive Systems and the Implications of Equilibrium Theory](#)," *IEEE Conference on Electronic Commerce (CEC)*, San Diego, California, USA, pp. 213-220, July 2004.
36. A. Knight, K. Almeroth and B. Bimber, "[An Automated System for Plagiarism Detection Using the Internet](#)," *World Conference on Educational Multimedia, Hypermedia & Telecommunications (ED MEDIA)*, Lugano, Switzerland, pp. 3619-3625, June 2004.
35. H. Zhang and K. Almeroth, "[Supplement to Distance Learning: Design for a Remote TA Support System](#)," *World Conference on Educational Multimedia, Hypermedia & Telecommunications (ED MEDIA)*, Lugano, Switzerland, pp. 2821-2830, June 2004.
34. U. Mohan, K. Almeroth and E. Belding, "[Scalable Service Discovery in Mobile Ad hoc Networks](#)," *IFIP Networking Conference*, Athens, Greece, pp. 137-149, May 2004.
33. V. Thanedar, K. Almeroth and E. Belding, "[A Lightweight Content Replication Scheme for Mobile Ad hoc Environments](#)," *IFIP Networking Conference*, Athens, Greece, pp. 125-136, May 2004.
32. R. Chalmers and K. Almeroth, "[A Mobility Gateway for Small-Device Networks](#)," *IEEE International Conference on Pervasive Computing and Communications (PerCom)*, Orlando, Florida, USA, March 2004.
31. A. Jardosh, E. Belding, K. Almeroth and S. Suri, "[Towards Realistic Mobility Models For Mobile Ad hoc](#)

[Networks](#)," *ACM Mobicom*, San Diego, California, USA, September 2003.

30. K. Sarac, P. Namburi and K. Almeroth, "[SSM Extensions: Network Layer Support for Multiple Senders in SSM](#)," *International Conference on Computer Communication and Networks (IC3N)*, Dallas, Texas, USA, October 2003.
29. K. Ramachandran and K. Almeroth, "[MAFIA: A Multicast Management Solution for Access Control and Traffic Filtering](#)," *IEEE/IFIP Conference on Management of Multimedia Networks and Services (MMNS)*, Belfast, Northern Ireland, September 2003.
28. J. Humfrey, S. Rollins, K. Almeroth, and B. Bimber, "[Managing Complexity in a Networked Learning Environment](#)," *World Conference on Educational Multimedia, Hypermedia & Telecommunications (ED MEDIA)*, Honolulu, Hawaii, USA, pp. 60-63, June 2003.
27. K. Almeroth, S. Rollins, Z. Shen, and B. Bimber, "[Creating a Demarcation Point Between Content Production and Encoding in a Digital Classroom](#)," *World Conference on Educational Multimedia, Hypermedia & Telecommunications (ED MEDIA)*, Honolulu, Hawaii, USA, pp. 2-5, June 2003.
26. M. Kolsch, K. Kvilekval, and K. Almeroth, "[Improving Speaker Training with Interactive Lectures](#)," *World Conference on Educational Multimedia, Hypermedia & Telecommunications (ED MEDIA)*, Honolulu, Hawaii, USA, June 2003.
25. P. Rajvaidya and K. Almeroth, "[Analysis of Routing Characteristics in the Multicast Infrastructure](#)," *IEEE Infocom*, San Francisco, California, USA, April 2003.
24. S. Rollins and K. Almeroth, "[Pixie: A Jukebox Architecture to Support Efficient Peer Content Exchange](#)," *ACM Multimedia*, Juan Les Pins, FRANCE, December 2002.
23. S. Rollins, R. Chalmers, J. Blanquer, and K. Almeroth, "[The Active Information System\(AIS\): A Model for Developing Scalable Web Services](#)," *IASTED International Conference on Internet and Multimedia Systems and Applications (IMSA)*, Kauai, Hawaii, USA, August 2002.
22. S. Rollins and K. Almeroth, "[Seminal: Additive Semantic Content for Multimedia Streams](#)," *IASTED International Conference on Internet and Multimedia Systems and Applications (IMSA)*, Kauai, Hawaii, USA, August 2002.
21. B. Stiller, K. Almeroth, J. Altmann, L. McKnight, and M. Ott, "[Content Pricing in the Internet](#)," *SPIE ITCOM Conference on Internet Performance and Control of Network Systems (IPCNS)*, Boston, Massachusetts, USA, July 2002.
20. S. Jagannathan, J. Nayek, K. Almeroth and M. Hofmann, "[A Model for Discovering Customer Value for E-Content](#)," *ACM International Conference on Knowledge Discovery and Data Mining (SIGKDD)*, Edmonton, Alberta, CANADA, July 2002.
19. S. Rollins and K. Almeroth, "[Deploying and Infrastructure for Technologically Enhanced Learning](#)," **Outstanding Paper** at the *World Conference on Educational Multimedia, Hypermedia & Telecommunications (ED MEDIA)*, Denver, Colorado, USA, pp. 1651-1656, June 2002.
18. P. Rajvaidya and K. Almeroth, "[Building the Case for Distributed Global Multicast Monitoring](#)," *Multimedia Computing and Networking (MMCN)*, San Jose, California, USA, January 2002.
17. S. Jagannathan and K. Almeroth, "[An Adaptive Pricing Scheme for Content Delivery Systems](#)," *IEEE Global Internet*, San Antonio, Texas, USA, November 2001.
16. K. Sarac and K. Almeroth, "[Providing Scalable Many-to-One Feedback in Multicast Reachability Monitoring Systems](#)," *IFIP/IEEE International Conference on Management of Multimedia Networks and Services (MMNS)*, Chicago, Illinois, USA, October 2001.

15. S. Jagannathan and K. Almeroth, "[The Dynamics of Price, Revenue and System Utilization](#)," *IFIP/IEEE International Conference on Management of Multimedia Networks and Services (MMNS)*, Chicago, Illinois, USA, October 2001.
14. A. Kanwar, K. Almeroth, S. Bhattacharyya, and M. Davy, "[Enabling End-User Network Monitoring via the Multicast Consolidated Proxy Monitor](#)," *SPIE ITCom Conference on Scalability and Traffic Control in IP Networks (STCIPN)*, Denver, Colorado, USA, August 2001.
13. S. Jagannathan and K. Almeroth, "[Using Tree Topology for Multicast Congestion Control](#)," *International Conference on Parallel Processing (ICPP)*, Valencia, SPAIN, September 2001.
12. P. Rajvaidya and K. Almeroth, "[A Router-Based Technique for Monitoring the Next-Generation of Internet Multicast Protocols](#)," *International Conference on Parallel Processing (ICPP)*, Valencia, SPAIN, September 2001.
11. R. Chalmers and K. Almeroth, "[Modeling the Branching Characteristics and Efficiency Gains of Global Multicast Trees](#)," *IEEE Infocom*, Anchorage, Alaska, USA, April 2001.
10. R. Chalmers and K. Almeroth, "[Developing a Multicast Metric](#)," *Global Internet*, San Francisco, California, USA, December 2000.
9. K. Sarac and K. Almeroth, "[Monitoring Reachability in the Global Multicast Infrastructure](#)," *IEEE International Conference on Network Protocols (ICNP)*, Osaka, JAPAN, November 2000.
8. K. Almeroth, "[A Long-Term Analysis of Growth and Usage Patterns in the Multicast Backbone \(MBone\)](#)," *IEEE INFOCOM*, Tel Aviv, ISRAEL, March 2000.
7. K. Almeroth, K. Obraczka and D. De Lucia, "[A Lightweight Protocol for Interconnecting Heterogeneous Devices in Dynamic Environments](#)," *IEEE International Conference on Multimedia Computing and Systems (ICMCS)*, Florence, ITALY, June 1999.
6. K. Almeroth and M. Ammar, "[The Interactive Multimedia Jukebox \(IMJ\): A New Paradigm for the On-Demand Delivery of Audio/Video](#)," **Best Paper** at the *Seventh International World Wide Web Conference (WWW)*, Brisbane, AUSTRALIA, April 1998.
5. K. Almeroth, M. Ammar and Z. Fei, "[Scalable Delivery of Web Pages Using Cyclic Best-Effort \(UDP\) Multicast](#)," *IEEE INFOCOM*, San Francisco, California, USA, June 1998.
4. K. Almeroth and M. Ammar, "[Delivering Popular Web Pages Using Cyclic Unreliable Multicast \(Extended Abstract\)](#)," *SPIE Conference on Voice, Video and Data Communications*, Dallas, Texas, USA, November 1997.
3. K. Almeroth, A. Dan, D. Sitaram and W. Tetzlaff, "[Long Term Resource Allocation in Video Delivery Systems](#)," *IEEE INFOCOM*, Kobe, JAPAN, April 1997.
2. K. Almeroth and M. Ammar, "[On the Performance of a Multicast Delivery Video-On-Demand Service with Discontinuous VCR Actions](#)," *International Conference on Communications (ICC)*, Seattle, Washington, USA, June 1995.
1. K. Almeroth and M. Ammar, "[A Scalable, Interactive Video-On-Demand Service Using Multicast Communication](#)," *International Conference on Computer Communication and Networks (IC3N)*, San Francisco, California, USA, September 1994.

### C. Workshop Papers (refereed)

34. M. Tavakolifard, J. Gulla, K. Almeroth, F. Hopfgartner, B. Kille, T. Plumbaum, A. Lommatzsch, T. Brodt, A.

Bucko, and T. Heintz, "[Workshop and Challenge on News Recommender Systems](#)," *ACM RecSys News Recommender Systems (NRS) Workshop and Challenge*, Hong Kong, CHINA, October 2013.

33. M. Tavakolifard, K. Almeroth, and J. Gulla, "[Does Social Contact Matter? Modelling the Hidden Web of Trust Underlying Twitter](#)," *ACM International Workshop on Social Recommender Systems (SRS)*, Rio de Janeiro, BRAZIL, May 2013.
32. D. Johnson, E. Belding, K. Almeroth and G. van Stam, "[Internet Usage and Performance Analysis of a Rural Wireless Network in Macha, Zambia](#)," *ACM Networked Systems for Developing Regions (NSDR) Workshop*, San Francisco, California, USA, June 2010.
31. D. Havey, R. Chertov, and K. Almeroth, "[Wired Wireless Broadcast Emulation](#)," *International Workshop on Wireless Network Measurement (WiNMee)*, Seoul, Korea, June 2009.
30. R. Raghavendra, P. Acharya, E. Belding, and K. Almeroth, "[MeshMon: A Multi-Tiered Framework for Wireless Mesh Network Monitoring](#)," *ACM Mobihoc Wireless of the Students, by the Students, for the Students Workshop (S3)*, New Orleans, Louisiana, USA, May 2009.
29. G. Swamynathan, C. Wilson, B. Boe, B. Zhao, and K. Almeroth, "[Do Social Networks Improve e-Commerce: A Study on Social Marketplaces](#)," *ACM Sigcomm Workshop on Online Social Networks (WOSN)*, Seattle, Washington, USA, August 2008.
28. R. Raghavendra, E. Belding, and K. Almeroth, "[Antler: A Multi-Tiered Approach to Automated Wireless Network Management](#)," *IEEE Workshop on Automated Network Management (ANM)*, Phoenix, Arizona, USA, April 2008.
27. S. Karpinski, E. Belding, and K. Almeroth, "[Towards Realistic Models of Wireless Workload](#)," *International Workshop on Wireless Network Measurement (WiNMee)*, Limassol, CYPRUS, April 2007.
26. K. Harras, M. Wittie, K. Almeroth, and E. Belding, "[ParaNets: A Parallel Network Architecture for Challenged Networks](#)," *IEEE Workshop on Mobile Computing Systems and Applications (HotMobile)*, Tucson, Arizona, USA, February 2007.
25. H. Caituiro-Monge, K. Almeroth, M. del Mar Alvarez-Rohena, "[Friend Relay: A Resource Sharing Framework for Mobile Wireless Devices](#)," *ACM International Workshop on Wireless Mobile Applications and Services on WLAN Hotspots (WMASH)*, Los Angeles, California, September 2006.
24. G. Swamynathan, Ben Y. Zhao and K. Almeroth, "[Exploring the Feasibility of Proactive Reputations](#)," *International Workshop on Peer-to-Peer Systems (IPTPS)*, Santa Barbara, California, USA, February 2006.
23. G. Swamynathan, Ben Y. Zhao and K. Almeroth, "[Decoupling Service and Feedback Trust in a Peer-to-Peer Reputation System](#)," *International Workshop on Applications and Economics of Peer-to-Peer Systems (AEPP)*, Nanjing, CHINA, November 2005.
22. K. Ramachandran, M. Buddhikot, G. Chandranmenon, S. Miller, E. Belding, and K. Almeroth, "[On the Design and Implementation of Infrastructure Mesh Networks](#)," *IEEE Workshop on Wireless Mesh Networks (WiMesh)*, Santa Clara, California, USA, September 2005.
21. A. Jardosh, K. Ramachandran, K. Almeroth and E. Belding, "[Understanding Link-Layer Behavior in Highly Congested IEEE 802.11b Wireless Networks](#)," *Sigcomm Workshop on Experimental Approaches to Wireless Network Design and Analysis (EWIND)*, Philadelphia, Pennsylvania, USA, August 2005.
20. A. Sen Mazumder, K. Almeroth and K. Sarac, "[Facilitating Robust Multicast Group Management](#)," *Network and Operating System Support for Digital Audio and Video (NOSSDAV)*, Skamania, Washington, USA, June 2005.
19. Y. Sun, I. Sheriff, E. Belding and K. Almeroth, "[An Experimental Study of Multimedia Traffic Performance in Mesh Networks](#)," *MobiSys International Workshop on Wireless Traffic Measurements and Modeling (WitMeMo)*,

Seattle, Washington, USA, June 2005.

18. K. Ramachandran, K. Almeroth and E. Belding, "[A Framework for the Management of Large-Scale Wireless Network Testbeds](#)," International Workshop on Wireless Network Measurement (WinMee), Trentino, ITALY, April 2005.
17. A. Garyfalos, K. Almeroth and K. Sanzgiri, "[Deployment Complexity Versus Performance Efficiency in Mobile Multicast](#)," *International Workshop on Broadband Wireless Multimedia: Algorithms, Architectures and Applications (BroadWiM)*, San Jose, California, USA, October 2004.
16. C. Ho, K. Ramachandran, K. Almeroth and E. Belding, "[A Scalable Framework for Wireless Network Monitoring](#)," *ACM International Workshop on Wireless Mobile Applications and Services on WLAN Hotspots (WMASH)*, Philadelphia, Pennsylvania, USA, October 2004.
15. A. Garyfalos, K. Almeroth and J. Finney, "[A Hybrid of Network and Application Layer Multicast for Mobile IPv6 Networks](#)," *International Workshop on Large-Scale Group Communication (LSGC)*, Florence, ITALY, October 2003.
14. A. Garyfalos, K. Almeroth and J. Finney, "[A Comparison of Network and Application Layer Multicast for Mobile IPv6 Networks](#)," *ACM Workshop on Modeling, Analysis and Simulation of Wireless and Mobile Systems (MSWiM)*, San Diego, California, USA, September 2003.
13. S. Jagannathan, and K. Almeroth, "[Pricing and Resource Provisioning for Delivering E-Content On-Demand with Multiple Levels-of-Service](#)," *International Workshop on Internet Charging and QoS Technologies (ICQT)*, Zurich, SWITZERLAND, October 2002.
12. S. Rollins, K. Almeroth, D. Milojevic, and K. Nagaraja, "[Power-Aware Data Management for Small Devices](#)," *Workshop on Wireless Mobile Multimedia (WoWMoM)*, Atlanta, GA, USA, September 2002.
11. K. Almeroth, S. Bhattacharyya, and C. Diot, "[Challenges of Integrating ASM and SSM IP Multicast Protocol Architectures](#)," *International Workshop on Digital Communications: Evolutionary Trends of the Internet (IWDC)*, Taormina, ITALY, September 2001.
10. K. Sarac and K. Almeroth, "[Scalable Techniques for Discovering Multicast Tree Topology](#)," *Network and Operating System Support for Digital Audio and Video (NOSSDAV)*, Port Jefferson, New York, USA, June 2001.
9. P. Rajvaidya, K. Almeroth and K. Claffy, "[A Scalable Architecture for Monitoring and Visualizing Multicast Statistics](#)," *IFIP/IEEE International Workshop on Distributed Systems: Operations & Management (DSOM)*, Austin, Texas, USA, December 2000.
8. S. Jagannathan, K. Almeroth and A. Acharya, "[Topology Sensitive Congestion Control for Real-Time Multicast](#)," *Network and Operating System Support for Digital Audio and Video (NOSSDAV)*, Chapel Hill, North Carolina, USA, June 2000.
7. K. Sarac and K. Almeroth, "[Supporting the Need for Inter-Domain Multicast Reachability](#)," *Network and Operating System Support for Digital Audio and Video (NOSSDAV)*, Chapel Hill, North Carolina, USA, June 2000.
6. D. Makofske and K. Almeroth, "[MHealth: A Real-Time Multicast Tree Visualization and Monitoring Tool](#)," *Network and Operating System Support for Digital Audio and Video (NOSSDAV)*, Basking Ridge New Jersey, USA, June 1999.
5. K. Almeroth and Y. Zhang, "[Using Satellite Links as Delivery Paths in the Multicast Backbone \(MBone\)](#)," *ACM/IEEE International Workshop on Satellite-Based Information Services (WOSBIS)*, Dallas, Texas, USA, October 1998.
4. M. Ammar, K. Almeroth, R. Clark and Z. Fei, "[Multicast Delivery of Web Pages OR How to Make Web Servers](#)

[Pushy](#)," *Workshop on Internet Server Performance (WISP)*, Madison, Wisconsin, USA, June 1998.

3. K. Almeroth and M. Ammar, "[Prototyping the Interactive Multimedia Jukebox](#)," *Mini-conference on Multimedia Appliances, Interfaces, and Trials--International Conference on Communications (ICC)*, Montreal, Quebec, CANADA, June 1997.
2. K. Almeroth and M. Ammar, "[Collection and Modeling of the Join/Leave Behavior of Multicast Group Members in the MBone](#)," *High Performance Distributed Computing Focus Workshop (HPDC)*, Syracuse, New York, USA, August 1996.
1. K. Almeroth and M. Ammar, "[The Role of Multicast Communication in the Provision of Scalable and Interactive Video-On-Demand Service](#)," *Network and Operating System Support for Digital Audio and Video (NOSSDAV)*, Durham, New Hampshire, USA, April 1995.

## D. Non-Refereed Publications

8. K. Almeroth, E. Belding, M. Buddhikot, G. Chandranmenon, S. Miller, and K. Ramachandran, "[Infrastructure Mesh Networks](#)," *U.S. Patent Application US20070070959 A1*, September 2005.
7. K. Almeroth, R. Caceres, A. Clark, R. Cole, N. Duffield, T. Friedman, K. Hedayat, K. Sarac, M. Westerlund, "[RTP Control Protocol Extended Reports \(RTCP XR\)](#)," *Internet Engineering Task Force (IETF) Request for Comments (RFC) 3611*, November 2003.
6. Z. Albanna, K. Almeroth, D. Meyer, and M. Schipper, "[IANA Guidelines for IPv4 Multicast Address Allocation](#)," *Internet Engineering Task Force (IETF) Request for Comments (RFC) 3171*, August 2001.
5. B. Quinn and K. Almeroth, "[IP Multicast Applications: Challenges and Solutions](#)," *Internet Engineering Task Force (IETF), Request for Comments (RFC) 3170*, September 2001.
4. K. Almeroth, L. Wei and D. Farinacci, "[Multicast Reachability Monitor \(MRM\) Protocol](#)," *Internet Engineering Task Force Internet Draft*, July 2000.
3. K. Almeroth and L. Wei, "[Justification for and use of the Multicast Reachability Monitor \(MRM\) Protocol](#)," *Internet Engineering Task Force Internet Draft*, March 1999.
2. K. Almeroth, "[Managing IP Multicast Traffic: A First Look at the Issues, Tools, and Challenges](#)," IP Multicast Initiative White Paper, San Jose, California, USA, February 1999.
1. K. Almeroth, K. Obraczka and D. De Lucia, "[Pseudo-IP: Providing a Thin Network Protocol for Semi-Intelligent Wireless Devices](#)," *DARPA/NIST Smart Spaces Workshop*, Gaithersburg, Maryland, USA, July 1998.

## E. Released Software Systems

19. *A Multi-radio Wireless Mesh Network Architecture* -- <http://moment.cs.ucsb.edu/tic/>. Released December 1, 2006 (with K. Ramachandran, I. Sheriff, and E. Belding). The software as part of a multi-radio wireless mesh network that includes a Split Wireless Router that alleviates the interference that can occur between commodity radios within a single piece of hardware. The second is server software to perform channel assignment and communicate the assignments throughout the mesh network.
18. *AODV-Spanning Tree (AODV-ST)* -- <http://www.cs.ucsb.edu/~krishna/aodv-st/>. Released September 1, 2006 (with K. Ramachandran and E. Belding). AODV-ST is an extension of the well-known AODV protocol specifically

designed for wireless mesh networks. The advantages of AODV-ST over AODV include support for high throughput routing metrics, automatic route maintenance for common-case traffic, and low route discovery latency.

17. ***The Multicast Detective*** -- [http://www.nmsl.cs.ucsb.edu/mcast\\_detective/](http://www.nmsl.cs.ucsb.edu/mcast_detective/). Released September 1, 2005 (with A. Sen Mazumder). The multicast detective is a robust solution to determine the existence and nature of multicast service for a particular user. By performing a series of tests, a user can determine whether there is network support for multicast, and consequently, whether a multicast group join is likely to succeed.
16. ***AutoCap: Automatic and Accurate Captioning*** -- <http://www.nmsl.cs.ucsb.edu/autocap/>. Released August 1, 2005 (with A. Knight). AutoCap is a software system that takes as input an audio/video file and a text transcript. AutoCap creates captions by aligning the utterances in the audio/video file to the transcript. For those words that are not recognized, AutoCap estimates when the words were spoken along with an error bound that gives the content creator an idea of caption accuracy. The result is a collection of accurately time-stamped captions that can be displayed with the video.
15. ***PAIRwise Plagiarism Detection System*** -- <http://cits.ucsb.edu/pair/>. Released July 1, 2005 (with A. Knight). PAIRwise is a plagiarism detection system with: (1) an easy-to-use interface for submitting papers, (2) a flexible comparison engine that allows intra-class, inter-class, and Internet-based comparisons, and (3) an intuitive graphical presentation of results.
14. ***DAMON Multi-Hop Wireless Network Monitoring*** -- <http://moment.cs.ucsb.edu/damon/>. Released October 1, 2004 (with K. Ramachandran and E. Belding). DAMON is a distributed system for monitoring multi-hop mobile networks. DAMON uses agents within the network to monitor network behavior and send collected measurements to data repositories. DAMON's generic architecture supports the monitoring of a wide range of protocol, device, or network parameters.
13. ***Multicast Firewall*** -- <http://www.nmsl.cs.ucsb.edu/mafia/>. Released June 1, 2004 (with K. Ramachandran). MAFIA, a multicast firewall and traffic management solution, has the specific aim of strengthening multicast security through multicast access control, multicast traffic filtering, and DoS attack prevention.
12. ***AODV@IETF Peer Routing Software*** -- <http://moment.cs.ucsb.edu/aodv-ietf/>. Released November 1, 2003 (with K. Ramachandran and E. Belding). One of the first large-scale efforts to run the Ad hoc On demand Distance Vector (AODV) routing protocol in a public space (at the Internet Engineering Task Force (IETF)). The implementation includes a daemon that runs on both the Linux and Windows operating systems.
11. ***Mobility Obstacles*** -- <http://moment.cs.ucsb.edu/mobility/>. Released September 1, 2003 (with A. Jardosh, E. Belding, and S. Suri). The topology and movement of nodes in ad hoc protocol simulation are key factors in protocol performance. In this project, we have developed ns-2 simulation plug-ins that create more realistic movement models through the incorporation of obstacles. These obstacles are utilized to restrict both node movement and wireless transmissions.
10. ***mwalk*** -- <http://www.nmsl.cs.ucsb.edu/mwalk/>. Released December 1, 2000 (with R. Chalmers). Mwalk is a collection of Java applications and Perl scripts which re-create a global view of a multicast session from mtrace and RTCP logs. Users to the site can download mwalk, examine the results of our analysis, or download data sets for use in simulations dependent on multicast tree characteristics.
9. ***MANTRA2*** -- <http://www.nmsl.cs.ucsb.edu/mantra/>. Released December 1, 1999 (with P. Rajvaidya). This new version of MANTRA focuses on the visualization of inter-domain routing statistics. Working in conjunction with the Cooperative Association for Internet Data Analysis (CAIDA) we have developed advanced collection and visualization techniques.
8. ***MRM*** -- <http://www.nmsl.cs.ucsb.edu/mrm/>. Released October 1, 1999 (with K. Sarac). MRM is the Multicast Reachability Protocol. We have implemented an end-host agent that responds to MRM Manager commands. Our end-host agent works in conjunction with Cisco routers to detect and isolate multicast faults.

7. **MANTRA** -- <http://www.nmsl.cs.ucsb.edu/mantra/>. Released January 1, 1999 (with P. Rajvaidya). MANTRA is the Monitoring and Analysis of Traffic in Multicast Routers. It uses scripts to collect and display data from backbone multicast routers.
6. **SDR Monitor** -- <http://www.nmsl.cs.ucsb.edu/sdr-monitor/>. Released January 1, 1999 (with K. Sarac). The SDR Monitor receives e-mail updates from participants containing information about observed sessions in the MBone. A global view of multicast reachability is then constructed.
5. **The MHealth tool** -- <http://www.nmsl.cs.ucsb.edu/mhealth/>. Released September 1, 1998 (with D. Makofske). The mhealth tool graphically visualizes MBone multicast group trees and provides 'health' information including end-to-end losses per receiver and losses on a per hop basis. The implementation required expertise in Java, the MBone tools, and Unix.
4. **The MControl tool** -- <http://www.nmsl.cs.ucsb.edu/mcontrol/>. Released August 1, 1998 (with D. Makofske). Mcontrol is a tool to provide VCR-based interactivity for live MBone sessions. The implementation required expertise in Java, the MBone tools, and Unix.
3. **Interactive Multimedia Jukebox (IMJ)** -- <http://imj.ucsb.edu/>. Released October 1, 1996. The IMJ combines the WWW and the MBone conferencing tools to provide a multi-channel video jukebox offering both instructional and entertainment programming on a wide scale. The implementation required expertise in HTML, Perl, C, the MBone tools, and Unix.
2. **Mlisten** -- <http://www.cc.gatech.edu/computing/Telecomm/mbone/>. Released September 1, 1995. A tool to continuously collect MBone multicast group membership information including number and location of members, membership duration, and inter-arrival time for all audio and video sessions. The implementation required expertise in C, Tcl/Tk, the MBone tools, and UNIX socket programming.
1. **Audio-on-Demand (AoD)**. March 1, 1995. A server/client prototype to demonstrate interactivity in near VoD systems. The AoD server provides songs-on-demand and VCR-like functions via multicast IP over Ethernet. The implementation required expertise in C, OpenWindows programming, UNIX socket programming, and network programming.

## F. Tutorials, Panels and Invited Talks

- "25th Anniversary Panel," Network and Operating System Support for Digital Audio and Video (NOSSDAV), Portland, Oregon, USA, March 2015.
- "Sensing and Opportunistic Delivery of Ubiquitous Video in Health Monitoring, On-Campus and Social Network Applications," Workshop on Mobile Video Delivery (MoViD), Chapel Hill North Carolina, USA, February 2012.
- "Medium Access in New Contexts: Reinventing the Wheel?," USC Invited Workshop on Theory and Practice in Wireless Networks, Los Angeles, California, USA, May 2008.
- "The Wild, Wild West: Wireless Networks Need a New Sheriff," University of Florida CISE Department Lecture Series, Gainesville, Florida, USA, February 2008.
- "Distinguishing Between Connectivity, Intermittent Connectivity, and Intermittent Disconnectivity," Keynote at the ACM MobiCom Workshop on Challenged Networks (CHANTS), Montreal, CANADA, September 2007.
- "The Three Ghosts of Multicast: Past, Present, and Future," Keynote at the Trans-European Research and Education Networking Association (TERENA) Networking Conference, Lynby, DENMARK, May 2007.
- "Multicast Help Wanted: From Where and How Much?," Keynote at the Workshop on Peer-to-Peer Multicasting

(P2PM), Las Vegas, Nevada, USA, January 2007.

- "The Confluence of Wi-Fi and Apps: What to Expect Next," Engineering Insights, UC-Santa Barbara, Santa Barbara, California, USA, October 2006.
- "Challenges, Opportunities, and Implications for the Future Internet," University of Minnesota Digital Technology Center, Minneapolis, Minnesota, USA, September 2006.
- "Wireless Technology as a Catalyst: Possibilities for Next-Generation Interaction," Santa Barbara Forum on Digital Transitions, Santa Barbara, California, USA, April 2006.
- "Challenges and Opportunities in an Internet with Pervasive Wireless Access," University of Texas--Dallas Computer Science Colloquium, Dallas, Texas, USA, March 2006.
- "Challenges and Opportunities with Pervasive Wireless in the Internet," Duke University Computer Science Colloquium, Durham, North Carolina, USA, February 2006.
- "The Span From Wireless Protocols to Social Applications," Intel Research Labs, Cambridge, United Kingdom, December 2005.
- "The Internet Dot.Com Bomb and Beyond the Dot.Com Calm," CSE IGERT and Cal Poly Lecture Series, San Luis Obispo, California, USA, October 2005.
- "Panel: Directions in Networking Research," IEEE Computer Communications Workshop (CCW), Irvine, California, USA, October 2005.
- "Economic Incentives for Ad Hoc Networks," KAIST New Applications Seminar, Seoul, South Korea, March 2004.
- "New Applications for the Next Generation Internet," Citrix Systems, Santa Barbara, California, USA, March 2004.
- "PI: The Imperfect Pursuit of Pure Pattern," CITS Visions in Technology Series, Santa Barbara, California, USA, January 2004.
- "Panel: Core Networking Issues and Protocols for the Internet," National Science Foundation (NSF) Division of Advanced Networking Infrastructure and Research (ANIR) Principal Investigators Workshop, Washington DC, USA, March 2003.
- "Panel: Pricing for Content in the Internet," SPIE ITCom Internet Performance and Control of Network Systems, Boston, Massachusetts, USA, July 2002.
- "The Technology Behind Wireless LANs," Central Coast MIT Enterprise Forum, Santa Barbara, California, USA, March 2002.
- "Lessons Learned in the Digital Classroom," Center for Information and Technology Brown Bag Symposium, Santa Barbara, California, USA, March 2002.
- "The Evolution of Advanced Networking Services: From the ARPAnet to Internet2," California State University--San Luis Obispo CS Centennial Colloquium Series, San Luis Obispo, California, USA, February 2002.
- "Deployment of IP Multicast in Campus Infrastructures," Internet2 Campus Deployment Workshop, Atlanta, Georgia, USA, May 2001.
- "Multicast: Is There Anything Else to Do?," Sprint Research Retreat, Miami, Florida, USA, May 2001.
- "The Evolution of Next-Generation Internet Services and Applications," Government Technology Conference 2001 (GTC) for the Western Region, Sacramento, California, USA, May 2001.

- "I2 Multicast: Not WIDE-scale Deployment, FULL-scale Deployment," Closing Plenary, Internet2 Member Meetings, Washington, D.C., USA, March 2001.
- "Panel: Beyond IP Multicast," Content Delivery Networks (CDN), New York, New York, USA, February 2001.
- "Viable Multicast Pricing & Business Models for Wider-Scale Deployment," Content Delivery Networks (CDN), New York, New York, USA, February 2001.
- "IP Multicast: Modern Protocols, Deployment, and Management," Content Delivery Networks (CDN), New York, New York, USA, February 2001 & San Jose, California, USA, December 2001.
- "Under the Hood of the Internet," Technology 101: Technology for Investors, Center for Entrepreneurship & Engineering Management, November 2000.
- "Understanding Multicast Traffic in the Internet," (1) University of Virginia, (2) University of Maryland, and (3) Columbia University, September 2000.
- "The Bad, The Ugly, and The Good: The Past, Present, and Future of Multicast," Digital Fountain, San Francisco, California, USA, August 2000.
- "Implications of Source-Specific Multicast (SSM) on the Future of Internet Content Delivery," Occam Networks, Santa Barbara, California, USA, August 2000.
- "Introduction to Multicast Routing Protocols," UC-Berkeley Open Mash Multicast Workshop, Berkeley, California, USA, July 2000.
- "Efforts to Understand Traffic and Tree Characteristics," University of Massachusetts--Amherst Colloquia, Amherst, Massachusetts, USA, May 2000.
- "Monitoring Multicast Traffic," Sprint Research Retreat, Half Moon Bay, California, USA, April 2000.
- "What is the Next Generation of Multicast in the Internet?," HRL Laboratories, Malibu, California, USA, January 2000.
- "Mission and Status of the Center for Information Technology and Society (CITS)," Intel Research Council, Portland, Oregon, USA, September 1999.
- "Multicast at a Crossroads," IP Multicast Initiative Summits and Bandwidth Management Workshops, San Francisco, CA, USA, (1) October 1999; (2) February 2000; and (3) June 2000.
- "IP Multicast: Modern Protocols, Deployment, and Management," Networld+Interop: (1) Las Vegas, Nevada, USA--May 2000; (2) Tokyo, JAPAN--June 2000; (3) Atlanta, Georgia, USA--September 2000; (4) Las Vegas, Nevada, USA--May 2001; (5) Las Vegas, Nevada, USA--May 2002.
- "IP Multicast: Practice and Theory" (w/ Steve Deering), Networld+Interop: (1) Las Vegas, Nevada, USA--May 1999; (2) Tokyo, JAPAN--June 1999; and (3) Atlanta, Georgia, USA--September 1999.
- "Internet2 Multicast Testbeds and Applications," Workshop on Protocols for High Speed Networks (PfHSN), Salem, Massachusetts, USA, August 1999.
- "IP Multicast: Protocols for the Intra- and Inter-Domain," Lucent Technologies, Westford, Massachusetts, USA, August 1999.
- "Internet2 Multicast Testbeds and Applications," NASA Workshop: Bridging the Gap, Moffett Field, California, USA, August 1999.
- "The Evolution of Next-Generation Services and Applications in the Internet," Tektronix Distinguished Lecture

Series, Portland, Oregon, USA, May 1999.

- "Multicast Applications and Infrastructure in the Next Generation Internet," CENIC 99 Workshop on Achieving Critical Mass for Advanced Applications, Monterey, California, USA, May 1999.
- "Multicast Traffic Monitoring and Analysis Work at UCSB" (w/ P. Rajvaidya), Workshop on Internet Statistics and Metrics Analysis (ISMA), San Diego, California, USA, April 1999.
- "How the Internet Works: Following Bits Around the World," Science Lite, Santa Barbara General Affiliates and Office of Community Relations, California, USA, February 1999.
- "Managing Multicast: Challenges, Tools, and the Future," IP Multicast Initiative Summit, San Jose, California, USA, February 1999.
- "The Future of Multicast Communication and Protocols," Internet Bandwidth Management Summit (iBAND), San Jose, California, USA, November 1998.
- "An Overview of IP Multicast: Applications and Deployment," (1) Workshop on Evaluating IP Multicast as the Solution for Webcasting Real-Time Networked Multimedia Applications, New York, New York, USA, July 1998; and (2) Satellites and the Internet Conference, Washington, D.C., USA, July 1998.
- "IETF Developments in IP Multicast," IP Multicast Initiative Summit, San Jose, California, USA, February 1998.
- "An Introduction to IP Multicast and the Multicast Backbone (MBone)" vBNS Technical Meeting sponsored by the National Center for Network Engineering (NLNRE), San Diego, California, USA, February 1998.
- "Using Multicast Communication to Deliver WWW Pages" Computer Communications Workshop (CCW '97), Phoenix, Arizona, USA, September 1997.

## G. Research Funding

- K. Almeroth, "Packet Scheduling Using IP Embedded Transport Instrumentation," Cisco Systems Inc., \$100,000, 3/1/13-8/31/14.
- K. Almeroth, E. Belding and S.J. Lee, "GOALI: Maximizing Available Bandwidth in Next Generation WLANs", National Science Foundation (NSF), \$101,088, 10/1/13-9/30/14.
- K. Almeroth and E. Belding, "GOALI: Intelligent Channel Management in 802.11n Networks," National Science Foundation (NSF), \$51,000, 10/1/10-9/30/11.
- B. Zhao, K. Almeroth, H. Zheng, and E. Belding, "NeTS: Medium: Airlab: Distributed Infrastructure for Wireless Measurements," National Science Foundation (NSF), \$700,000, 9/1/09-8/13/13.
- K. Almeroth, E. Belding and T. Hollerer, "NeTS-WN: Wireless Network Health: Real-Time Diagnosis, Adaptation, and Management," National Science Foundation (NSF), \$600,000, 10/1/07-9/30/10.
- K. Almeroth, "Next-Generation Service Engineering in Internet2," University Consortium for Advanced Internet Development (UCAID), \$1,254,000, 7/1/04-6/30/09 (reviewed and renewed each year).
- B. Manjunath, K. Almeroth, F. Bullo, J. Hespanha, T. Hollerer, C. Krintz, U. Madhow, K. Rose, A. Singh, and M. Turk, "Large-Scale Multimodal Wireless Sensor Network," Office of Naval Research Defense University Research Instrumentation Program (DURIP), \$655,174, 4/14/08-4/14/09.
- K. Almeroth and E. Belding, "Improving Robustness in Evolving Wireless Infrastructures," Intel Corporation,

\$135,000, 7/1/06-6/30/09 (reviewed and renewed for second and third year).

- K. Almeroth and K. Sarac, "Bridging Support in Mixed Deployment Multicast Environments," Cisco Systems Inc., \$100,000, 9/1/07-8/31/08.
- K. Sarac and K. Almeroth, "Building the Final Piece in One-to-Many Content Distribution," Cisco Systems Inc., \$95,000, 9/1/06-8/31/07.
- E. Belding, K. Almeroth and J. Gibson, "Real-Time Communication Support in a Ubiquitous Next-Generation Internet," National Science Foundation (NSF), \$900,000, 10/1/04-9/30/07.
- K. Almeroth and K. Sarac, "Improving the Robustness of Multicast in the Internet," Cisco Systems Inc., \$80,000, 9/1/04-8/31/05.
- R. Mayer, B. Bimber, K. Almeroth and D. Chun, "Assessing the Pedagogical Implications of Technology in College Courses," Mellon Foundation, \$350,000, 7/1/04-6/30/07.
- B. Bimber, A. Flanagan and C. Stol, "Technological Change and Collective Association: Changing Relationships Among Technology, Organizations, Society and the Citizenry," National Science Foundation (NSF), \$329,175, 7/1/04-6/30/07.
- K. Almeroth and B. Bimber, "Plagiarism Detection Techniques and Software," UCSB Instructional Development, \$22,000, 7/1/04-6/30/05.
- K. Almeroth, "Student Travel Support for the 14th International Workshop on Network and Operating Systems Support for Digital Audio and Video (NOSSDAV)," National Science Foundation (NSF), \$10,000, 5/1/04-8/31/04.
- K. Almeroth, "An Automated Indexing System for Remote, Archived Presentations," QAD Inc., \$25,000, 5/1/04-6/30/05.
- K. Almeroth and M. Turk, "A Remote Teaching Assistant Support System," Microsoft, \$40,000, 1/1/04-6/30/05.
- K. Almeroth, "Supporting Multicast Service Functionality in Helix," Real Networks, \$30,000, 9/1/03-6/30/04.
- K. Almeroth and E. Belding, "Service Discovery in Mobile Networks," Nokia Summer Research Grant (U. Mohan), \$10,240, 7/1/03-9/30/03.
- K. Almeroth, D. Zappala, "Building a Global Multicast Service," Cisco Systems Inc., \$100,000, 1/1/03-indefinite.
- K. Almeroth, "Developing A Dynamic Protocol for Candidate Access Router Discovery," Nokia Graduate Student Fellowship (R. Chalmers), \$26,110, 9/01/02-6/30/03.
- B. Bimber and K. Almeroth, "The Role of Collaborative Groupware in Organizations," Toole Family Foundation, \$182,500 (\$20,000 cash plus \$162,500 in software), 9/1/02-indefinite.
- B. Manjunath, et al., "Digital Multimedia: Graduate Training Program in Interactive Digital Multimedia," National Science Foundation (NSF), \$2,629,373, 4/1/02-3/31/07.
- J. Green, K. Almeroth, et al., "Inquiry in the Online Context: Learning from the Past, Informing the Future," UCSB Research Across Disciplines, \$10,000, 9/1/01-8/31/02.
- K. Almeroth, "Monitoring and Maintaining the Global Multicast Infrastructure," Cisco Systems Inc., \$54,600, 7/1/01-indefinite.
- R. Kemmerer, K. Almeroth, et al., "Hi-DRA High-speed, Wide-area Network Detection, Response, and Analysis," Department of Defense (DoD), \$4,283,500, 5/1/01-4/30/06.

- A. Singh, K. Almeroth, et al., "Digital Campus: Scalable Information Services on a Campus-wide Wireless Network," National Science Foundation (NSF), 1,450,000, 9/15/00-12/31/04.
- K. Almeroth, "Visualizing the Global Multicast Infrastructure," UC MICRO w/ Cisco Systems Inc., \$85,438, 7/1/00-6/30/02.
- H. Lee, K. Almeroth, et al., "Dynamic Sensing Systems," International Telemetering Foundation, \$260,000, 07/01/00-06/30/04.
- B. Bimber and K. Almeroth, "Funding for the Center on Information Technology and Society," \$250,000 from Dialogic (an Intel Company) and \$250,000 from Canadian Pacific.
- K. Almeroth, "CAREER: From Protocol Support to Applications: Elevating Multicast to a Ubiquitous Network Service," National Science Foundation (NSF), \$200,000, 9/1/00-8/31/04.
- K. Almeroth, "Characterizing Multicast Use and Efficiency in the Inter-Domain," Sprint Advanced Technology Laboratories, \$62,500, 3/1/00-indefinite.
- K. Almeroth, "Producing the Next Generation of Multicast Monitoring and Management Protocols and Tools," UC MICRO w/ Cisco Systems Inc., \$124,500, 7/1/99 - 6/30/01.
- K. Almeroth, "Utilizing Satellite Links in the Provision of an Inter-Wide Multicast Service," HRL Laboratories, \$20,000, 7/1/99 - indefinite.
- T. Smith, K. Almeroth, et al., "Alexandria Digital Earth Prototype," National Science Foundation, \$5,400,000, 4/1/99-3/31/04.
- V. Vesna, K. Almeroth, et al., "Online Public Spaces: Multidisciplinary Explorations in Multi-User Environments (OPS:MEME), Phase II," UCSB Research Across Disciplines, \$50,000, 9/1/98-8/31/99.
- K. Almeroth, "Techniques and Analysis for the Provision of Multicast Route Management," UC MICRO w/ Cisco Systems Inc., \$97,610, 7/1/98 - 6/30/00.
- K. Almeroth, "Capturing and Modeling Multicast Group Membership in the Multicast Backbone (MBone)," UC MICRO w/ Hughes Research Labs, \$19,146, 7/1/98 - 12/31/99.
- K. Almeroth, "Building a Content Server for the Next Generation Digital Classroom," UCSB Faculty Research Grant, \$5,000, 7/1/98-6/31/99.

## H. Research Honors and Awards

- IEEE Fellow Status, 2013
- Finalist for Best Paper Award, IEEE Conference on Sensor and Ad Hoc Communications and Networks (SECON), June 2008
- Best Paper Award, Passive and Active Measurement (PAM) Conference, April 2007
- Outstanding Paper Award, World Conference on Educational Multimedia, Hypermedia & Telecommunications (ED MEDIA), June 2006
- IEEE Senior Member Status, 2003
- Finalist for Best Student Paper Award, ACM Multimedia, December 2002
- Outstanding Paper Award, World Conference on Educational Multimedia, Hypermedia & Telecommunications (ED MEDIA), June 2002
- Computing Research Association (CRA) Digital Government Fellowship, 2001
- National Science Foundation CAREER Award, 2000

- Best Paper Award, 7th International World Wide Web Conference, April 1998

### **III. Service**

#### **A. Professional Activities**

##### **1. Society Memberships**

Member, Association for Computing Machinery (ACM): 1993-present  
 Member, ACM Special Interest Group on Communications (SIGComm): 1993-present  
 Fellow, Institute of Electrical and Electronics Engineers (IEEE): 1993-present  
 Member, IEEE Communications Society (IEEE ComSoc): 1993-present  
 Member, American Society for Engineering Education (ASEE): 2003-2006

##### **2. Review Work for Technical Journals and Publishers**

NSF CISE research proposals, IEEE/ACM Transactions on Networking, IEEE/ACM Transactions on Computers, IEEE/ACM Transactions on Communications, IEEE Transactions on Circuits and Systems for Video Technology, IEEE Transactions on Parallel and Distributed Systems, IEEE Transactions on Multimedia, IEEE Communications, IEEE Communications Letters, IEEE Network, IEEE Internet Computing, IEEE Multimedia, IEEE Aerospace & Electronics Systems Magazine, ACM Transactions on Internet Technology, ACM Transactions on Multimedia Computing, Communications and Applications, ACM Computing Surveys, ACM Computer Communications Review, ACM Computeres in Entertainment, ACM/Springer Multimedia Systems Journal, AACE Journal of Interactive Learning (JILR), International Journal of Computer Mathematics, Journal of Communications and Networks, Journal of Parallel and Distributed Computing, Journal of Network and Systems Management, Journal of High Speed Networking, Journal of Communications and Networks, Journal on Selected Areas in Communications, Journal of Wireless Personal Communications, Personal Mobile Communications, Annals of Telecommunications, International Journal of Wireless and Mobile Computing, Pervasive and Mobile Computing (PMC), Wireless Networks Journal, Computer Networks Journal, Cluster Computing, Computer Communications, Mobile Computing and Communications Review, Performance Evaluation, Software--Practice & Experience, Information Processing Letters, ACM Sigcomm, ACM Multimedia, ACM Network and System Support for Digital Audio and Video Workshop (NOSSDAV), ACM Sigcomm Workshop on the Economics of Peer-to-Peer Systems (P2PEcon), ACM Sigcomm Workshop on Challenged Networks (CHANTS), IEEE Infocom, IEEE Globecom, IEEE Global Internet (GI) Symposium, IEEE Globecom Automatic Internet Symposium, IEEE Globecom Internet Services and Enabling Technologies (IS&ET) Symposium, IEEE International Symposium on a World of Wireless, Mobile and Multimedia Networks (WoWMoM), IEEE International Conference on Network Protocols (ICNP), IEEE Conference on Sensor and Ad Hoc Communications and Networks (SECON), IEEE International Conference on Multimedia and Exposition (ICME), IEEE International Conference on Communications (ICC), IEEE International Conference on Parallel and Distributed Systems (ICPADS) IEEE International Symposium on High-Performance Distributed Computing (HPDC), IEEE International Conference on Distributed Computing Systems (ICDCS), IEEE International Workshop on Quality of Service (IWQoS), IEEE/IFIP Network Operations and Management Symposium (NOMS), IFIP/IEEE International Symposium on Integrated Network Management (IM), IFIP/IEEE International Conference on Management of Multimedia Networks and Services (MMNS), IEEE Aerospace & Electronics Systems Magazine, SPIE Conference on Multimedia Computing and Networking (MMCN), IFIP Networking, IASTED International Conference on Information Systems and Databases

(ISD), IASTED International Conference on Communications, Internet, and Information Technology, IASTED International Conference on Internet and Multimedia Systems and Applications (IMSA), IASTED International Conference on European Internet and Multimedia Systems and Applications (EuroIMSA), IASTED International Conference on Communications and Computer Networks (CCN), IASTED International Conference on Software Engineering and Applications (SEA), International Conference on Computer and Information Science (ICIS), International Association for Development of the Information Society (IADIS) International Conference on the WWW/Internet, Workshop on Network Group Communication (NGC), International Conference on Next Generation Communication (CoNEXT), International Conference on Parallel Processing (ICPP), International Conference on Computer Communications and Networks (IC3N), International Workshop on Hot Topics in Peer-to-Peer Systems (Hot-P2P), International Workshop on Wireless Network Measurements (WinMee), International Workshop on Incentive-Based Computing (IBC), International Workshop on Multi-hop Ad Hoc Networks (REALMAN), International Workshop on Broadband Wireless Multimedia: Algorithms, Architectures and Applications (BroadWIM), International Packet Video (PV) Workshop, High Performance Networking Conference (HPN), International Parallel Processing Symposium (IPPS), International Symposium on Innovation in Information & Communication Technology (ISIICT), Workshop on Coordinated Quality of Service in Distributed Systems (COQODS), Pearson Education (Cisco Press) Publishers, Macmillan Technical Publishing, and Prentice Hall Publishers.

### **3. Conference Committee Activities**

#### **Journal/Magazine Editorial Board**

IEEE/ACM Transactions on Networking (ToN): 2003-2009, 2013-present  
 Journal of Network and Systems Management (JNSM): 2011-present  
 ACM Computers in Entertainment: 2002-present  
 IEEE Network: 1999-2012  
 AACE Journal of Interactive Learning Research (JILR): 2003-2012  
 IEEE Transactions on Mobile Computing (TMC): 2006-2011  
 ACM Computer Communications Review (CCR): 2006-2010

#### **Journal/Magazine Guest Editorship**

IEEE Journal on Selected Areas in Communications (JSAC) Special Issue on "Delay and Disruption Tolerant Wireless Communication", June 2008  
 Computer Communications Special Issue on "Monitoring and Measuring IP Networks", Summer 2005  
 Computer Communications Special Issue on "Integrating Multicast into the Internet", March 2001

#### **Conference/Workshop Steering Committee**

IEEE International Conference on Network Protocols (ICNP): 2007-present  
 ACM Sigcomm Workshop on Challenged Networks (CHANTS): 2006-present  
 International Workshop on Network and Operating System Support for Digital Audio and Video (NOSSDAV): 2001-present, 2005-2011 (chair), 2012-present (co-chair)  
 IEEE Global Internet (GI) Symposium: 2005-2013  
 IFIP/IEEE International Conference on Management of Multimedia Networks and Services (MMNS): 2005-2009

#### **Conference/Workshop Chair**

International Conference on Communication Systems and Networks (COMSNETS): 2014 (co-chair)  
 ACM International Conference on Next Generation Communication (CoNext): 2013 (co-chair)  
 ACM RecSys News Recommender Systems (NRS) Workshop and Challenge: 2013 (co-chair)  
 ACM Sigcomm Workshop on Challenged Networks (CHANTS): 2006 (co-chair)

IEEE International Conference on Network Protocols (ICNP): 2003 (co-chair), 2006  
International Workshop on Wireless Network Measurements (WiNMee): 2006 (co-chair)  
IFIP/IEEE International Conference on Management of Multimedia Networks and Services (MMNS): 2002 (co-chair)  
International Workshop on Network and Operating System Support for Digital Audio and Video (NOSSDAV): 2002 (co-chair), 2003 (co-chair)  
IEEE Global Internet (GI) Symposium: 2001 (co-chair)  
International Workshop on Networked Group Communication (NGC): 2000 (co-chair)

#### **Program Chair**

International Conference on Computer Communication and Networks (ICCCN): 2015 (Track co-chair)  
International Conference on Communication Systems and Networks (COMSNETS): 2010  
IEEE International Conference on Network Protocols (ICNP): 2008 (co-chair)  
IEEE Conference on Sensor and Ad Hoc Communications and Networks (SECON): 2007 (co-chair)  
IFIP Networking: 2005 (co-chair)

#### **Posters/Demonstrations Chair**

ACM Sigcomm: 2012 (co-chair)

#### **Student Travel Grants Chair**

ACM Sigcomm: 2010 (co-chair)

#### **Publicity Chair**

IFIP/IEEE International Conference on Management of Multimedia Networks and Services (MMNS): 2004 (co-chair)

#### **Keynote Chair**

IEEE Infocom: 2005 (co-chair)

#### **Local Arrangements Chair**

Internet2 "Field of Dreams" Workshop: 2000

#### **Tutorial Chair**

ACM Multimedia: 2000  
IEEE International Conference on Network Protocols (ICNP): 1999

#### **Panel/Session Organizer**

NSF ANIR PI 2003 Panel on "Core Networking Issues and Protocols for the Internet"  
CCW 2001 Session on "Multicast/Peer-to-Peer Networking"  
NOSSDAV 2001 Panel on "Multimedia After a Decade of Research"  
NGC 2000 Panel on "Multicast Pricing"

#### **Technical Program Committee**

IEEE International Conference on Network Protocols (ICNP): 1999, 2000, 2001, 2003, 2004, 2005, 2006, 2007, 2008, 2009 (Area Chair), 2010 (Area Chair), 2011 (Area Chair), 2012 (Area Chair), 2013, 2014 (Area Chair), 2015 (Area Chair), 2016 (Area Chair)  
International Workshop on Network and Operating System Support for Digital Audio and Video

(NOSSDAV): 2000, 2001, 2002, 2003, 2004, 2005, 2006, 2007, 2008, 2009, 2010, 2011, 2012, 2013, 2014, 2015, 2016

ACM Multimedia (MM): 2001, 2003, 2004, 2005 (short paper), 2006, 2007, 2008, 2008 (short paper), 2010, 2011, 2012, 2013, 2015

IEEE Conference on Sensor and Ad Hoc Communications and Networks (SECON): 2004, 2005, 2006, 2007, 2008, 2009, 2010, 2011 (Area Chair), 2012 (Area Chair), 2013, 2014 (Area Chair), 2015, 2016 (Area Chair)

IEEE/IFIP Network Operations and Management Symposium (NOMS): 2004, 2006, 2010

IEEE Infocom: 2004, 2005, 2006, 2008, 2009, 2010 (Area Chair), 2011 (Area Chair), 2012 (Area Chair)

IFIP Networking: 2004, 2005, 2006, 2007, 2010, 2011, 2012, 2013, 2014, 2015, 2016

ACM Workshop on Mobile Video (MoVid): 2014, 2015, 2016

ACM Student Research Competition (SRC) Grand Finals: 2014

Mobile and Social Computing for Collaborative Interactions (MSC): 2014

IEEE Conference on Communications and Network Security (CNS): 2013

IEEE International Symposium on a World of Wireless, Mobile and Multimedia Networks (WoWMoM): 2005, 2006, 2007, 2008, 2009, 2010

ACM Sigcomm Workshop on Challenged Networks (CHANTS): 2006, 2008, 2009, 2010, 2011, 2012, 2016

IEEE International Conference on Distributed Computing Systems (ICDCS): 2006, 2010, 2011, 2012, 2013

International Workshop on Wireless Network Measurements (WinMee): 2006, 2008, 2010

ACM Sigcomm: 2008 (poster), 2010

IEEE International Conference on Computer Communication and Networks (IC3N): 2008, 2009, 2010, 2011, 2012

International Conference on Communication Systems and Networks (COMSNETS): 2009, 2010, 2011, 2012, 2013

International Conference on Sensor Networks (SENSORNETS): 2012

International Workshop on Social and Mobile Computing for Collaborative Environments (SOMOCO): 2012

Workshop on Scenarios for Network Evaluation Studies (SCENES): 2009, 2010, 2011

ACM Multimedia Systems (MMSys): 2010, 2011, 2012, 2015, 2016

IEEE International Conference on Pervasive Computing and Communications (PerCom): 2010

IEEE Wireless Communications and Networking Conference (WCNC): 2010, 2011

ACM International Symposium on Mobility Management and Wireless Access (MobiWac): 2010, 2011

International Conference on Computing, Networking and Communications, Internet Services and Applications Symposium (ICNC-ISA): 2012, 2013

IEEE WoWMoM Workshop on Hot Topics in Mesh Networking (HotMesh): 2010, 2011, 2012, 2013

IEEE Workshop on Pervasive Group Communication (PerGroup): 2010

ACM International Conference on Next Generation Communication (CoNEXT): 2005, 2006, 2007, 2009, 2012

IEEE International Conference on Broadband Communications, Networks, and Systems (BroadNets)

Wireless Communications, Networks and Systems Symposium: 2007, 2008, 2009

IEEE International Conference on Broadband Communications, Networks, and Systems (BroadNets)

Internet Technologies Symposium: 2007, 2008, 2009

International Workshop on Mobile and Networking Technologies for Social Applications (MONET): 2008, 2009

Extreme Workshop on Communication-The Midnight Sun Expedition (ExtremeCom): 2009

IEEE International Workshop on Cooperation in Pervasive Environments (CoPE): 2009

International Workshop on the Network of the Future (FutureNet): 2009, 2010, 2011, 2012

IEEE International Conference on Multimedia and Exposition (ICME): 2010

SPIE Conference on Multimedia Computing and Networking (MMCN): 2004, 2008

ACM Sigcomm Workshop on the Economics of Networks, Systems, and Computation (NetEcon):

2008

IEEE International Conference on Communications (ICC): 2008

IEEE International Conference on Mobile Ad-hoc and Sensor Systems (MASS): 2008

IFIP/IEEE International Symposium on Integrated Network Management (IM): 2005, 2007

Global Internet (GI) Symposium: 2001, 2002, 2004, 2006, 2007

IEEE/ACM International Conference on High Performance Computing (HiPC): 2007

ACM International Symposium on Mobile Ad Hoc Networking and Computing (MobiHoc): 2007

IEEE Workshop on Embedded Systems for Real-Time Multimedia (ESTIMedia): 2007

IEEE/IFIP Wireless On Demand Network Systems and Services (WONS): 2007

IFIP/IEEE International Conference on Management of Multimedia Networks and Services (MMNS): 2001, 2002, 2003, 2004, 2005, 2006

IASTED International Conference on European Internet and Multimedia Systems and Applications (EuroIMSA): 2004, 2006

IEEE International Conference on Parallel and Distributed Systems (ICPADS): 2005, 2006

IEEE Globecom Internet Services and Enabling Technologies (IS&ET) Symposium: 2006

International Workshop on Incentive-Based Computing (IBC): 2006

IEEE International Workshop on Quality of Service (IWQoS): 2006, 2014, 2015

International Workshop on Multi-hop Ad Hoc Networks (REALMAN): 2006

IEEE Globecom Automatic Internet Symposium: 2005

ACM Sigcomm Workshop on the Economics of Peer-to-Peer Systems (P2PEcon): 2005

International Conference on Parallel Processing (ICPP): 2001, 2003, 2004

International Packet Video (PV) Workshop: 2002, 2003, 2004

IEEE International Symposium on High-Performance Distributed Computing (HPDC): 2004

ACM Sigcomm: 2004 (poster)

International Workshop on Broadband Wireless Multimedia: Algorithms, Architectures and Applications (BroadWIM): 2004

International Symposium on Innovation in Information & Communication Technology (ISIICT): 2004

Workshop on Coordinated Quality of Service in Distributed Systems (COQODS): 2004

IASTED International Conference on Networks and Communication Systems (NCS): 2004

IASTED International Conference on Communications, Internet, and Information Technology (CIIT): 2004

IASTED International Conference on Internet and Multimedia Systems and Applications (IMSA): 2003, 2004

International Workshop on Networked Group Communication (NGC): 1999, 2000, 2001, 2002, 2003

International Association for Development of the Information Society (IADIS) International Conference on the WWW/Internet: 2003

International Conference on Computer and Information Science (ICIS): 2003

Human.Society@Internet: 2003

IASTED International Conference on Communications and Computer Networks (CCN): 2002

The Content Delivery Networks (CDN) Event: 2001

IP Multicast Initiative Summit: 1998, 1999, 2000

Corporation for Education Network Initiatives in California (CENIC): 1999

Internet Bandwidth Management Summit (iBAND): 1998, 1999

## B. Technical Activities

### 1. Working Groups

Internet2 Working Group on Multicast, Chair: 1998-2005

IEEE Communications Society Internet Technical Committee (ITC), Conference Coordinator: 2000-2004

IETF Multicast Directorate (MADDOGS), Member: 1999-2001

IASTED Technical Committee on the Web, Internet and Multimedia, Member: 2002-2005  
Internet Engineering Task Force (IETF), various working groups: 1995-present

## **2. Meeting Support Work**

Internet Engineering Task Force MBone broadcasts: 1995-2005  
Conference MBone broadcasts: Sigcomm '99, and '00  
Interop+Networld Network Operations Center (NOC) Team Member: 1995-1997  
ACM Multimedia technical staff: 1994

## **C. University of California Committees**

### **1. Department of Computer Science Committees**

Public Relations: 2005-2006 (chair 2005-2006), 2009-2011 (chair 2009-2011)  
Strategic Planning: 2000-2002, 2003-2006, 2009-2011  
Undergraduate Advising and Affairs: 2006-2007, 2014-2015  
Vice Chair: 2000-2005  
Graduate Admissions: 2000-2005 (chair 2000-2005), 2011-2012  
Graduate Affairs: 2000-2005 (co-chair 2000-2005)  
Teaching Administration: 2000-2005  
Facilities: 1997-2001 (chair 1999-2000), 2006-2007  
External Relations: 1999-2002  
Computer Engineering Public Relations: 2011-2012  
Computer Engineering Awards: 2011-2012  
Computer Engineering Administration/Recruiting: 1998-2001  
Computer Engineering Lab and Computer Support: 1998-2001  
Faculty Recruiting: 1999-2002  
Graduate Advising: 1998-1999, 2000-2005

### **2. University Committees**

Member, Campus Budget and Planning: 2013-2015  
Faculty, Cognitive Science Program: 2006-present  
Faculty, Technology Management Program (TMP): 2003-2014  
Faculty, Media Arts and Technology (MAT) Program: 1998-2014  
Faculty, Computer Engineering Degree Program: 1998-present  
Steering Committee, Center for Information Technology and Society (CITS): 2012-present  
Associate Director, Center for Information Technology and Society (CITS): 1999-2012  
Member, Campus Committee on Committees: 2010-2013  
Member, Campus Income and Recharge Committee: 2010-2013  
Member, College of Engineering Executive Committee: 2010-2012 (chair 2011-2012), 2014-2015 (chair 2014-2015)  
Member, Distinguished Teaching Award Committee: 2009, 2010, 2011  
Member, Campus Classroom Design and Renovation Committee: 2003-2010  
Member, ISBER Advisory Committee: 2008-2011  
Member, Fulbright Campus Review Committee: 2007  
Member, Faculty Outreach Grant Program Review Committee: 2007  
Executive Vice Chancellor's Information Technology Fee Committee: 2005-2006

Council on Research and Instructional Resources: 2003-2006  
Executive Vice Chancellor's Working Group on Graduate Diversity: 2004-2005  
Member, Engineering Pavillion Planning Committee: 2003-2005  
Information Technology Board: 2001-2004  
Executive Committee, Center for Entrepreneurship & Engineering Management (CEEM): 2001-2004

### **3. System Wide Committees**

UCSB Representative to the Committee on Information Technology and Telecommunications Policy (ITTP): 2003-2005  
UCSB Representative to the Executive Committee, Digital Media Innovation (DiMI): 1998-2003

### **D. Georgia Tech Committees and Service (while a graduate student)**

Graduate Student Body President: 1994-1995  
Georgia Tech Executive Board: 1994-1995  
Georgia Tech Alumni Association Executive Committee: 1994-1995  
Dean of Students National Search Committee: 1995  
Institute Strategic Planning Committee: 1994-1996

Cases in last 4 years I have been deposed or testified:

- Two depositions in Intermec Technologies Corp. v. Palm Inc. (07-272-SLR, D. Del.). Finished: 05/12.
- A deposition in iHance, Inc. v. Eloqua Corp. (2:11-CV-257-MSD-TEM, E.D. Va.). Finished: 06/12.
- A deposition in Apple, Inc. v. Motorola Mobility, Inc. (11-CV-178 (BBC), W.D. Wis.). Finished: 10/12.
- A deposition and trial testimony in Two-Way Media LLC v. AT&T Inc., et al. (SA-09-CA-476-OLG, W.D. Tex.). Finished: 03/13.
- Depositions in British Telecommunications PLC v. CoxCom, Inc., Cox Communications, Inc., & Cable One, Inc. (10-658-SLR, D. Del.). Finished: 01/14.
- A deposition and trial testimony in Certain Digital Media Devices, Including Televisions, Blu-Ray Disc Players, Home Theater Systems, Tablets and Mobile Phones, Components Thereof and Associated Software (ITC Inv. No. 337-TA-882) [Black Hills Media v. Samsung]. Finished 02/14.
- A deposition in Inter Partes Review of U.S. Patent No. 7,107,612 (IPR2013-00369) [Palo Alto Networks, Inc. v. Juniper Networks, Inc.]. Finished 05/14.
- A deposition and trial testimony in EON Corp Holdings, LCC. v. Landis+Gyr, Inc., et al. (6:11-CV-317-LED-JDL, E.D. Tex.). Finished 06/14.
- Depositions in Straight Path IP Group, Inc. v. Bandwidth.com, Inc., Telesphere Networks Ltd., and Vocalocity, Inc. (1:13-CV-932, E.D. Va.). Finished 06/14.
- Depositions and trial testimony in Beneficial Innovations, Inc. v. Advanced Publications, Inc. et al. (2:11-CV-229-JRG-RSP, E.D. Tex.). Finished 07/14.
- Depositions in Robocast Inc. v. Apple Inc. (11-235-RGA, D. Del.) and Robocast Inc. v. Microsoft Corp. (10-1055-RGA, D. Del.). Finished 08/14.
- A deposition in PersonalWeb Technologies, LCC v. Yahoo! Inc. (6:12-CV-658-LED, E.D. Tex.). Finished 08/14.
- Depositions and trial testimony in Personal Audio LLC v. Togi Entertainment, Inc. et al. (2:13-CV-13-JRG-RSP, E.D. Tex.). Finished 09/14.
- A deposition in Inter Partes Review of U.S. Patent Nos. 8,326,924 and 8,239,451 (CBM2014-00001 and CBM2014-00050, respectively) [American Express Co. et al. v. Metasearch Systems, LLC]. Finished 09/14.
- Depositions in Inter Partes Review of U.S. Patent Nos. 6,044,062 (IPR2013-00482) and 6,249,516 (IPR2014-00147) [ABB Technology LTD v. IPCO, LLC]. Finished 10/14.
- A deposition in Inter Partes Review of U.S. Patent No. 5,995,091 (IPR2014-00153 and IPR2014-00154) [Adobe Systems Inc & Level3 Communications, LLC v. Afluo, LLC]. Finished 10/14.
- Depositions in Inter Partes Review of U.S. Patent Nos 8,145,268; 8,224,381; 8,135,398; 7,899,492; 8,050,711; and 8,712,471 (IPR2013-00569, IPR2013-00570, IPR2013-00571, IPR2013-00572, IPR2013-00573 and IPR2015-00054, respectively) [Samsung Electronics Co., LTD v. Virginia Innovation Sciences, Inc.]. Finished 11/14.
- A deposition in Black Hills Media, LLC v. Sonos, Inc. (14-cv-00486-SJC-PJWx, C.D. Cal.). Finished 02/15.
- Markman testimony in Personal Audio, LLC v. Apollo Brands et al. (1:14-CV-8-RC, E.D. Tex.). Finished 06/15.

- Depositions in Inter Partes Review of U.S. Patent Nos. 8,028,323; 8,230,099; 8,214,873; 6,108,686; 7,835,689; and 7,917,082 (IPR2014-00709, IPR2014-00711, IPR2014-00723, IPR2014-00717, IPR2014-00718, and IPR2014-00721, respectively) [Samsung Electronics Co., LTD v. Black Hills Media, LLC]. Finished 06/15.
- A deposition in Inter Partes Review of U.S. Patent No. 7,548,875 (IPR2014-01236) [MindGeek et al. v. Skky, Inc.]. Finished 06/15.
- A deposition in Inter Partes Review of U.S. Patent Nos. 7,468,661 (IPR2014-00751) [Hart Communication Foundation v. SIPCO, LLC]. Finished 07/15.
- Depositions in Inter Partes Review of U.S. Patent No. 6,754,195 (IPR2014-00552 and IPR2014-00553) [Marvell Semiconductor, Inc. v. Intellectual Ventures I LLC]. Finished 07/15.
- A deposition and trial testimony in Certain Network Devices, Related Software and Components Thereof (US ITC Inv. No. 337-TA-944) [Cisco v. Arista]. Finished 09/15.
- Depositions and trial testimony in Certain Network Devices, Related Software and Components Thereof (II) (US ITC Inv. No. 337-TA-945) [Cisco v. Arista]. Finished 12/15.
- A deposition in Inter Partes Review of U.S. Patent Nos. 6,286,045 (IPR2015-00657 and IPR2015-00660) and 6,014,698 (IPR2015-00662 and IPR2015-00666) [Google, Inc. v. At Home Bondholders Liquidated Trust]. Finished 12/15.
- A deposition in Sprint Communications Company LP v. Time Warner Cable, Inc. (11-2686-JWL, D. Kan.);
- A deposition in Cisco Systems, Inc. v. Arista Networks, Inc. (5:14-cv-5344-BLF, N.D. Cal.);
- A deposition in Certain Activity Tracking Devices, Systems, and Components Thereof (US ITC Inv. No. 337-TA-963) [Jawbone v. Fitbit].
- A deposition in Thomas C. Sisoian v. International Business Machines Corporation (A-14-CA-565-SS, W.D. Tex.)
- A deposition in Inter Partes Review of U.S. Patent Nos. 6,199,076 (IPR2015-00845) and 7,509,178 (IPR2015-00846) [Google, Inc. v. Personal Audio, LLC].

Cases in last 5 years I have been deposed or testified (I represented the underlined party):

- Two depositions in Beneficial Innovations, Inc. v. Blockdot, Inc. et al. (2:07-CV-263(TJW/CE) and 2:07-CV-555 (TJW/CE), E.D. Tex.). Finished: 10/10.
- Two depositions and trial testimony in Personal Audio, LLC v. Apple, Inc. (9:09-CV-00111-RC, E.D. Tex.). Finished: 07/11.
- Two depositions in Paltalk Holdings, Inc. v. Sony et al. (2:09-cv-274-DF-CE, E.D. Tex.). Finished: 09/11.
- A deposition and trial testimony in Certain Wireless Communication Devices, Portable Music and Data Processing Devices, Computers and Components (US ITC Inv. No. 337-TA-745) [Motorola Mobility v. Apple]. Finished: 04/12.
- Two depositions in Intermec Technologies Corp. v. Palm Inc. (07-272-SLR, D. Del.). Finished: 05/12.
- A deposition in iHance, Inc. v. Eloqua Corp. (2:11-CV-257-MSD-TEM, E.D. Va.). Finished: 06/12.
- A deposition in Apple, Inc. v. Motorola Mobility, Inc. (11-CV-178 (BBC), W.D. Wis.). Finished: 10/12.
- A deposition and trial testimony in Two-Way Media LLC v. AT&T Inc., et al. (SA-09-CA-476-OLG, W.D. Tex.). Finished: 03/13.
- Depositions in British Telecommunications PLC v. CoxCom, Inc., Cox Communications, Inc., & Cable One, Inc. (10-658-SLR, D. Del.). Finished: 01/14.
- A deposition and trial testimony in Certain Digital Media Devices, Including Televisions, Blu-Ray Disc Players, Home Theater Systems, Tablets and Mobile Phones, Components Thereof and Associated Software (ITC Inv. No. 337-TA-882) [Black Hills Media v. Samsung]. Finished 02/14.
- A deposition in Inter Partes Review of U.S. Patent No. 7,107,612 (IPR2013-00369) [Palo Alto Networks, Inc. v. Juniper Networks, Inc.]. Finished 05/14.
- A deposition and trial testimony in EON Corp Holdings, LCC. v. Landis+Gyr, Inc., et al. (6:11-CV-317-LED-JDL, E.D. Tex.). Finished 06/14.
- Depositions in Straight Path IP Group, Inc. v. Bandwidth.com, Inc., Telesphere Networks Ltd., and Vocalocity, Inc. (1:13-CV-932, E.D. Va.). Finished 06/14.
- Depositions and trial testimony in Beneficial Innovations, Inc. v. Advanced Publications, Inc. et al. (2:11-CV-229-JRG-RSP, E.D. Tex.). Finished 07/14.
- Depositions in Robocast Inc. v. Apple Inc. (11-235-RGA, D. Del.) and Robocast Inc. v. Microsoft Corp. (10-1055-RGA, D. Del.). Finished 08/14.
- A deposition in PersonalWeb Technologies, LCC v. Yahoo! Inc. (6:12-CV-658-LED, E.D. Tex.). Finished 08/14.
- Depositions and trial testimony in Personal Audio LLC v. Togi Entertainment, Inc. et al. (2:13-CV-13-JRG-RSP, E.D. Tex.). Finished 09/14.
- A deposition in Inter Partes Review of U.S. Patent Nos. 8,326,924 and 8,239,451 (CBM2014-00001 and CBM2014-00050, respectively) [American Express Co. et al. v. Metasearch Systems, LLC]. Finished 09/14.
- Depositions in Inter Partes Review of U.S. Patent Nos. 6,044,062 (IPR2013-00482) and 6,249,516 (IPR2014-00147) [ABB Technology LTD v. IPCO, LLC]. Finished 10/14.

- A deposition in Inter Partes Review of U.S. Patent No. 5,995,091 (IPR2014-00153 and IPR2014-00154) [Adobe Systems Inc & Level3 Communications, LLC v. Afluo, LLC]. Finished 10/14.
- A deposition in Black Hills Media, LLC v. Sonos, Inc. (14-cv-00486-SJC-PJWx, C.D. Cal.). Finished 02/15.
- Depositions in Inter Partes Review of U.S. Patent Nos 8,145,268; 8,224,381; and 8,135,398, (IPR2013-00569, IPR2013-00570, and IPR2013-00571, respectively) [Samsung Electronics Co., LTD v. Virginia Innovation Sciences, Inc.];
- Depositions in Inter Partes Review of U.S. Patent Nos. 8,028,323; 8,230,099; 8,214,873; 6,108,686; 7,835,689; and 7,917,082 (IPR2014-00709, IPR2014-00711, IPR2014-00723, IPR2014-00717, IPR2014-00718, and IPR2014-00721, respectively) [Samsung Electronics Co., LTD v. Black Hills Media, LLC];
- Depositions in Inter Partes Review of U.S. Patent No. 6,754,195 (IPR2014-00552 and IPR2014-00553) [Marvell Semiconductor, Inc. v. Intellectual Ventures I LLC];
- Markman testimony in Personal Audio, LLC v. Apollo Brands et al. (1:14-CV-8-RC, E.D. Tex.);
- A deposition in Inter Partes Review of U.S. Patent Nos. 7,468,661 (IPR2014-00751) [Hart Communication Foundation v. SIPCO, LLC]
- A deposition in Inter Partes Review of U.S. Patent No. 7,548,875 (IPR2014-01236) [MindGeek et al. v. Skky, Inc.];
- A deposition in Sprint Communications Company LP v. Time Warner Cable, Inc. (11-2686-JWL, D. Kan.);
- A deposition in Certain Network Devices, Related Software and Components Thereof (US ITC Inv. No. 337-TA-944) [Cisco v. Arista];

Cases With Reports/Declarations But No On-The-Record Testimony:

- Innovative Communications Technologies, Inc. v. Stalker Software, Inc. (2:12-CV-9-RGD-TEM, E.D. Va.). Finished: 11/12.
- Innovative Communications Technologies, Inc. v. ooVoo, LLC (2:12-CV-8-RGD-DEM, E.D. Va.). Finished: 11/12.
- Innovative Communications Technologies, Inc. v. Vivox, Inc. (2:12-CV-7-RGD-FBS, E.D. Va.). Finished: 11/12.
- SIPCO, LLC v. ABB, Inc. (6:11-cv-0048-LED-JDL). Finished: 12/12.
- Virginia Innovation Sciences, Inc. v. Samsung Electronics Co. LTD, Samsung Electronics America, Inc. and Samsung Telecommunications America LLC (2:12-cv-548-MSD-DEM, E.D. Va.). Finished: 04/14.
- PersonalWeb Technologies, LCC v. Google Inc. and YouTube, LLC (5:13-cv-01317 EJD, E.D. Tex.).
- Intellectual Ventures v. AT&T, CenturyLink, and Windstream (1:13-cv-00116-LY, 1:13-cv-00118-LY, 1:13-cv-00119-LY; W.D. Tex.)
- A declaration in Parallel Networks, LLC v. A10 Networks, Inc. (13-1943-LPS, D. Del.)

- A declaration in Affinity Labs of Texas, LLC v. Amazon.com Inc (6:15-cv-00029-WSS-JCM, W.D. Tex.)
- A declaration in Catharon Intellectual Property, LLC v. FedEx Corporate Services, Inc. (6:14-cv-00061-KNM, E.D. Tex.)

Cases Where I Have Been Disclosed (but no work product)

- Toddlerwatch.com v. Motorola (01-12187-REK, D. Mass.). Finished: 02/03.
- Personal Audio, LLC v. Samsung Electronics Co. Ltd. et al. (1:11-CV-432-RC, E.D. Tex.). Finished: 12/12.
- Enterasys Networks, Inc. v. Foundry Networks, LLC and Extreme Networks, Inc. (05-11298 (DPW), E.D. Mass.). Finished: 04/13.
- Mosaid Technologies, Inc. v. Dell, Inc. et al. (2:11-cv-00179-MHS-CMC, E.D. Tex.). Finished 08/13.
- Radware, Ltd. v. A10 Networks, Inc. (5:13-cv-02021-RMW, N.D. Cal.). Finished: 08/14
- Rockstar Consortium v. Google Inc. (13-cv-00893-JRG-RSP, E.D. Tex.). Finished 11/14.
- Intellectual Ventures I LLC and Intellectual Ventures II LLC v. AT&T Mobility LLC, et al. (1:12-cv-00193-LPS, D. Del.)
- OpenTV, Inc. et al. v. Apple, Inc. (14-cv-01622-JST, N.D. Cal.)
- Intellectual Ventures I LLC and Intellectual Ventures II LLC v. Symantec Corp. (13-440-(LPS), D. Del.)
- Certain Network Devices, Related Software and Components Thereof (II) (US ITC Inv. No. 337-TA-945) [Cisco v. Arista];